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REPORT OF THE

Secretary of Agriculture

1945

BENNETT T. SIMMS

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Secretary of Agriculture

1945

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WASHINGTON, DECEMBER 15, 1945

To the President

OUR FOOD AS A WEAPON OF WAR

All through the years of World War II, food produced on United States farms was of critical and decisive importance. As a weapon of war, food ranked with ships, planes, tanks, and guns. It was essential, not only to our own fighting efficiency, but to that of our allies, who like ourselves had to maintain colossal industrial production as well as enormous fighting forces. Hence, much more than during the first World War, we had to stop taking our food supply for granted and make every effort to increase it.

With the great dairy and hog producing areas of northwestern Europe temporarily held by the Axis, and with nearly all the world's exportable supplies of rice and about half its supplies of oils and fats in the hands of Japan, we could not have food enough. This was clear to everyone. We could say with conviction that without vastly greater food production than ever before this country could not win.

Now that the war is over, we are moving back toward our old position of virtual security in the matter of the food supply. In 1946 it will be difficult to meet total requirements for American farm products; the relief demand, commercial exports, and our needs will substantially exceed the supplies available. This, however, is just the current outlook. Unless we succeed in maintaining approximately full employment for the long pull and also in holding a considerable export trade for some farm commodities, our farms will produce ultimately more food than the markets will be ready to absorb. In short, the present demand situation is not necessarily a sign that agriculture will permanently have adequate markets.

Expanded farm capacity, as farmers know, does not readily contract. They cannot forget this truth, and they hope that the nonfarm economy will remember it. Agriculture emerges from the war with far more production capacity than it had before, and with a corresponding need for a wider market. The story of the wartime increase is thus also a warning that in the future we must work constantly for the expansion of demand.

The Farm Response to the War Call

Our farmers responded to the war call with an over-all production that rose to more than one-third above the prewar average. By comparison with the food production increase of the World War I years, the food gain was threefold greater. Moreover, by dint of broad and costly crop shifts, the farmers suited their output to the need, which was very different from that of the preceding peace years.

It was not, for example, the staple exports, such as wheat and cotton, that we principally needed in increased amounts. In the early war years we had large stocks of these crops; the military and lend-lease demand was rather for vastly increased quantities of meats, poultry and eggs, dairy products, and oil crops. These we had previously been consuming in quantities higher than those of any other country, and the demand to increase them further was a demand for more of what, by and large, had not been in surplus, and could be increased on the scale required only by means of extraordinary efforts.

When we consider the over-all wartime increase in the light of the inevitable shortages of manpower, machinery, and other means of farm production, the food achievement appears fully on a par with the Nation's war achievement generally. It was equally the product of science, skill, effort, and cooperation. In each successive full war year, from a level of production previously very high, the farmers pushed their output higher and higher.

Even in 1945, with the war concluded and with feed grain and other reserves largely gone, the total output of crops and livestock was very nearly equal to the record outputs of 1942 and 1944. In 1946 the world will have less food than in any of the war years, and less than before the war. Fortunately, in the United States the available supply will be far above the prewar level, and some of it will go to war-stricken lands.

Corn in 1945 was again a 3-billion-bushel crop, for the fourth year in succession. As in 1944, wheat was more than a 1-billion-bushel crop. The oats crop exceeded 1½ billion bushels. Tobacco passed the 2-billion-pound mark for the first time. Output of livestock and livestock products was about the same as in 1944 and only a little below the 1943 high mark. In total, food grain production in 1945 was the largest on record, feed grain production the second largest, and livestock production the second or third largest. Production for sale or for use on the farm was nearly one-third greater than in the five prewar years, as compared with 36 percent greater in 1944. On a long-term basis, this Department calculated that agriculture came out of the war easily capable of maintaining an output 25 percent above the prewar level, and in a position to expand its production-capacity much more with adequate longtime market inducement.

Crop shifts, within a virtually constant crop acreage, raised the cash crop output conspicuously during the war years. Cotton was the only big exception and this was intended. Among the tremendously expanded crops were the oilseeds, which for the three years 1943–45 averaged nearly three times the prewar production. Production of feed grains in 1943, 1944, and 1945 averaged about 34

percent and of hay about 18 percent above the prewar output. Livestock production in these same years averaged about 40 percent above the prewar level. It was not the weather that chiefly accounted for these gains, though the weather was favorable. Only about a quarter of the wartime increase can be attributed to the special kindness of nature; nor, as indicated, was acreage expansion an important factor. Chiefly responsible were the greater efforts of farmers and their families, general improvement in farm practices, and increased use of machinery, which economized manpower and also made possible better timing of farm operations. Farmers made big shifts from animal to tractor power. They increased their planting of improved crop varieties, made more use of cover crops and other conservation practices, cooperated effectively in pest and disease control campaigns, greatly enlarged their use of fertilizer, and improved the feeding of their livestock.

The Role of Government Agencies

Among Government encouragements to the war effort, special importance attached to the price-support programs. Commodities supported in price included most of the principal crops sold by farmers (except fresh fruits and vegetables) and important livestock products. Altogether, price supports were in effect for about 70 percent of the cash income received by farmers from marketings. Main features of the price supports were loan programs, purchases of some commodities direct from farmers, purchases of other commodities from processors and dealers, with the sellers required to pay minimum specified prices to farmers, and special payments to producers either directly or through processors. Simultaneously, the Federal agricultural agency cooperated in the "Hold the line" program for stabilizing prices and preventing inflation. This involved purchase and sales operations, accompanied by the use of subsidies. Connected with the price-supports were programs for the attainment of recommended production goals, which indicated to the farmers what the country needed and led to expansion combined with adjustment of crops to needs.

Efficient distribution seconded the farmers' efforts. At the peak of the war effort, the Federal agricultural agency was buying an average of 5 million dollars' worth of food each day for various Government programs. In these operations it collaborated with the armed forces. First, it sought to make sure the United States armed forces would have all the food they needed at the right times and in the right places. Second, it furnished an adequate diet for American civilians on a per capita level above that of the prewar years. Third, through the Combined Food Board, it answered the calls of the allies and of other contributors to the war effort. Cooperating food industries, assisted by industry committees, helped to maintain a free flow of food for all essential requirements. Frequently the claims exceeded the supplies; occasionally, certain difficulties developed, such as pressure on storage facilities, shortages of manpower at packing plants, and local shortages of storage, packing, and grading facilities

for eggs. There was difficulty in marketing the large potato crops and the 122-million-pig crop of 1943. On balance, nevertheless, the distribution system worked smoothly and well; it moved supplies rapidly and on the whole without waste from the farms to the fighting fronts and to civilian consuming centers.

Comparison of the food output with that of World War I has been mentioned. Specifically, from 1935–39 to 1944 the food output increased about 38 percent, whereas from 1909–13 to 1918 the increase was only about 16 percent. Food exports increased correspondingly, about 90 percent of them under lend-lease. From the beginning of lend-lease in March 1941 through 1944, more than 61 percent of the lend-lease food shipments went to the United Kingdom; about 29 percent went to Russia; about 7.1 percent to the North African-Middle Eastern Mediterranean area; about 3.2 percent went to the China-India area; and less than 1 percent went to other countries. Meantime, under reverse lend-lease, various allied countries supplied considerable quantities of food to the United States armed forces. Our grain exports declined during the war years, but phenomenal increases took place in our overseas shipments of meats, eggs, dairy products, and fats and oils. In 1945 exports accounted for 12 percent of the food supply; the United States military and other war services absorbed 10 percent, and the remaining 78 percent went to civilians. Throughout the war years, the per capita supplies of food for civilians after deducting exports and military needs were greater than in the prewar (1935–39) years and greater than in the years of World War I.

Three-Way Division of Output

As evidence of how well agriculture did its job in the war years, it will be useful to look in more detail at the food distribution for military, export, and civilian requirements. Our military services during the war years absorbed about 12 or 13 percent of the food supplies available from this country. Moreover, the military requirements involved many highly concentrated foods such as meat and dairy products, which required elaborate processing and rapid transport. For example, the military allocation of meat in 1945 exceeded 4 billion pounds. The military services took approximately 1 billion pounds of evaporated milk in 1945 and 900 million pounds of eggs in terms of fresh equivalent. Indeed, the military requirements represented a more important factor than these percentages imply, since they dipped especially into the high protein and relatively expensive items. As soldiers left this country for overseas duty, the kinds of food they needed changed. Canned or dried fruits or vegetables replaced fresh supplies. Processed meat largely replaced fresh meat; cheese and evaporated milk had to be substituted for fresh milk. This general change toward the less perishable types of foods involved high-pressure demands on the processing industries, which the latter met with remarkable success. Civilian rationing and set-aside orders helped to make the necessary military quantities available.

In the export field (lend-lease and other), the United States exported about 5 to 8 percent of its total supplies on a tonnage basis.

Previously we had been exporting only a few commodities in large volumes—cotton, lard, wheats, and a number of fruit and vegetable crops. The wartime composition of the exports was radically different.

On the average, during the war years the United States provided the United Kingdom, for example, with about 5 percent of its total food volume. But this contribution provided approximately 10 percent of the calories obtained by British civilians and the British military personnel; 15 percent of the animal proteins and close to 20 percent of the total fat intake. It was consequently a vital contribution, without which the British might not have been able to carry on.

In 1945 we exported wheat in large volume, with the result that about 12 percent of our total food supply went abroad, with large quantities going to liberated areas. There were large unfilled needs in the Far East as well as in Europe. But American supplies, besides clinching the victory, meant the difference between life and starvation in some countries.

The United States civilians' share of the total United States food supply was 94 percent in 1940, 86 percent in 1941, 86 percent in 1942, and 80 percent in both 1943 and 1944. It will be remembered, moreover, that in these years our total food supply was increasing steadily. Hence these percentages represented a much higher civilian consumption than in the prewar years. Generally the nutrition of United States civilians improved, though there were still those who did not get adequate diets. Many families were still low in their consumption of calcium and riboflavin, sometimes from lack of income, sometimes from lack of knowledge about nutrition. But on the whole civilian food consumption during the war years was better than ever before.

THE FARM RECONVERSION PROBLEM

Like the rest of our economy, agriculture faces difficult reconversion problems; in order to deal with them it must look back and look ahead. The look back will show how war has changed agriculture—how it has altered the type and volume of farm production, the farm production capacity, the soil, and other farm resources. These resources must now be fitted to the tasks of the future.

If ever there was a time for hard, clear thinking about the agriculture to come, and how we should shape it, that time is now. Farming, along with industry, is moving into an era in which vast increases in production of goods and services are possible. But we must plan how to use that productivity, and how to expand it along well-balanced lines. We cannot drift aimlessly, with the hope that the course of events will bring about the best use of land, the fairest prices, and the most effective distribution. Fortunately, we have a breathing spell in agriculture; we are not up against desperate situations such as we faced in 1933. We should use this period for thinking and planning, for setting definite goals, and for inquiring how to reach them. And though we have some time for this, we cannot afford to waste any. We cannot allow problems that are now small to become huge and possibly overwhelming. Briefly we can-

not afford to lose the magnificent opportunities of today and tomorrow for preparing to build a modern, well-rounded, prosperous agriculture.

This year's crops continue to reflect the war's momentum. Still far above the prewar level, and not much below that of 1944, the crop and livestock output is the result of effort toward goals adopted months before the war ended. The November report indicated a harvest a little below the record harvests of 1942 and 1944; frosts damaged the corn crop but it escaped major frost injury. Total meat production will be only about 1½ billion pounds less than 1944's record total of 24.5 billion pounds; it will exceed the prewar (1935–39) average by 6 billion pounds. Dairy production will go above last year's high mark. The flow of milk in the summer was an all-time record; in the later months it was nearer to the stepped-up output of the latter part of 1944. Egg production, 5 percent lower in the first 10 months than in the corresponding period of 1944, was nevertheless 36 percent above the average of the last 10 years. Farm production in 1945 is all-out war production, like that of the preceding war years; the small extent to which it is below the wartime peak is attributable partly to weather conditions and partly to the necessity for adjusting livestock to available feed supplies.

Changing Food Requirements

Necessarily, the allied victory over Germany and Japan alters food requirements. It alters the requirements downward for military and lend-lease shipments, and upward for relief purposes and for United States civilians. In view of these changing conditions, which necessitate a careful appraisal, production goals for 1946 are even more selective than those of the war years. Accurate estimates of the most desirable production pattern are fully as important in the reconversion period as they were at the height of the war effort.

Total United States military requirements for food in 1946 will be far below those of 1945, which have included the needs of prisoners of war, of certain allied troops, and of many civilians connected with military operations. Military responsibility for emergency feeding of civilian populations will decline. Military food requirements for 1946, if our total military strength drops to 3 million by the end of the year, may be only one-fifth as great as those of the high point in 1945.

On the other hand, total United States civilian food consumption has been increasing rapidly since the end of the war. Large increases in civilian consumption of many foods previously rationed will probably occur.

Butter consumption is likely to be limited for some time by the demand for fluid milk and other dairy products which limit the amount of cream available for butter. Cheese consumption will undoubtedly rise well above the wartime civilian level, and likewise evaporated milk consumption. In general the demand for dairy products will be strong in relation to supplies. Altogether the civilian consumption of milk and dairy products may amount to the milk equivalent of 117 billion pounds—about 6 billion pounds more than the

record consumption of 1942. Civilian meat consumption will rise substantially; on a per capita basis it may approach 150 pounds, as compared with this year's estimated 130 pounds. Consumption of poultry may be about the same as in 1945, but the consumption of eggs may drop from about 390 to possibly 350 per capita. Wheat consumption for food will probably not change; the consumption of rice and dry beans, however, may increase. Consumption of sugar and of fats and oils will reflect shortage of supplies.

Adjustments to Foreign Trade

Certain governmental controls still apply to food exports and food imports, though since the war ended the policy has been to remove them as rapidly as supply conditions permit. Both the export and the import controls are functions of this Department, the export controls under an Executive order of September 27 which transferred them here from the Foreign Economic Administration and the import controls by action of the War Production Board taken last spring. Throughout the war years these controls have been administered in line with recommendations as to food allocations. Under present conditions foods that are available in sufficient quantities may be exported freely, except to a small number of countries, including Spain and Argentina. On certain products which remain under allocation, but for which the foreign demand is small, the export controls have been removed. With wartime food scarcity largely over in the United States, the outlook is for a comparatively rapid return to peacetime methods in food exporting.

This Department reviewed the food import controls with an interagency committee shortly after VJ-day. As a result of the committee's recommendations, the import controls are being continued only to assure appropriate distribution of world food supplies and to protect public procurement programs for fats, oils, and oil-bearing materials, cocoa beans, and other important foods. Strict control over private importations of such items continues to be necessary, in some instances to prevent the possible diversion to the United States of shipments intended for other areas. Nevertheless, the number of products subject to the import controls has been reduced in the last year from about 175 to about 125. As supply conditions improve throughout the world, the food import controls can be relaxed along with the food export controls, and this will improve the outlook for international trade of all kinds.

Postwar Marketing Needs

Changes in marketing will be necessary in the postwar readjustment. Always a difficult problem, agricultural marketing will present new difficulties because production power has advanced beyond marketing facilities. Excessive costs and charges at various stages of marketing were a problem before the war; they reduced farm returns and at the same time raised prices to consumers. Under the conditions that the war has left, notably the great improvement in farm technology, the spread between farm and city prices may increase

further, if marketing facilities remain unimproved. Fortunately, the chance to improve the marketing system is good.

Considerable improvement may come from the activities of farmers' cooperatives, which have become important. They will be especially helpful if means can be developed to strengthen them and extend their coverage of areas and commodities. Marketing agreements promise an important contribution. Extensively developed in the last 10 years or so, and designed to promote orderly and efficient marketing through cooperation among Government agencies, farmer groups, and trade groups, they aim simultaneously to improve market organization and services, to reduce marketing costs, and to eliminate unfair and wasteful trade practices. This Department has had valuable experience during the war in working with the food trade, with hotel and restaurant organizations, and with institutional food users. This form of cooperation likewise may usefully be continued during the reconversion period.

It will be important, as supplies become more abundant, to improve our facilities for moving them into consumption through regular trade channels, so that the need for Government agencies to engage in buying and selling may be minimized. The improvement of marketing facilities works to this end because it reduces marketing costs. In other words, it lessens the need for other means to sustain net farm incomes, and at the same time makes food cheaper for consumers. It adds to the total consumption with benefit to all concerned—farmers, food handlers, and consumers. I have said that the physical plant for handling farm products has not kept pace with production technology; it is particularly necessary to provide more adequate and more efficient facilities in producing areas and in the terminal markets. There is a clear public interest in this.

Agriculture continues to face the problem of getting fair transportation rates, since transportation enters heavily into marketing costs. In the past, excessive transportation costs have often resulted from the charges and regulations imposed by the several States on the use of motortrucks. The charges have been high and the regulations complicated and diverse. During the war, however, some of these regulations have been suspended and others modified, with the result that transportation costs have been lower than they would have been otherwise. Advances of this type should be continued, and efforts made simultaneously to remove other handicaps to interstate commerce in farm commodities, such as various sanitary regulations that restrict markets excessively and various complicated grading, labeling, and packaging regulations.

The Farm Price Supports

Central in the reconversion process will be agriculture's price-support and production policy. Agricultural price policy for the reconversion period has been established by legislation, some of it enacted before we entered the war. For example, Public Law 147, approved July 1, 1941, directed the Secretary of Agriculture whenever he found it necessary to encourage the production of certain crops, to support the prices thereof and to give advance notice should a downward

adjustment be necessary later. This and other agricultural price legislation has since been modified in detail but not in principle. Briefly, it now provides that for 2 years following the January 1 after the designation of the end of hostilities the Government will support prices to producers for basic crops at 90 percent of parity; that it will support prices at not less than 90 percent of parity for nonbasic crops or Steagall-amendment commodities requested in increased amounts during the war; and that it will give price protection to other products on a comparable basis to the extent that funds are available and producers are able to bring supplies into line with demand.

Thus the postwar phase of this policy aims to protect producers while they make necessary readjustments. It expresses a determination to safeguard farmers against such a slump as occurred soon after World War I, and for this purpose provides procedures comparable to those provided for urban industries under war-contract termination laws. I regard this policy as wise and necessary. The Congress has manifested an intention to provide whatever funds may be required, and the Department of Agriculture in using these funds will employ the authorized procedures best suited to achieve a sound and clear-cut reconversion program. Certain prewar legislation, for example the Agricultural Adjustment Act of 1938, provides for the use of various methods in combination. Some combination of procedures may be necessary in the postwar period.

As mentioned, the wartime increase in farm production has been phenomenal, particularly in dairy and poultry products, oilseeds, and livestock feed. Civilians consumed only part of the increase; most of it went to our armed forces and our allies. In postwar years, the civilian market will be the principal outlet; relatively, neither military nor export needs will be large. Postwar price supports, however, are likely to be sufficiently attractive to farmers to maintain much of the wartime expansion in total farm production.

STRENGTH OF AGRICULTURE'S PRODUCTION FORCES

Probably not more than one fourth of the wartime increase in farm production can be attributed to better than average weather. True, the weather has been favorable during the war years. But an analysis of other major factors involved, notably shifts from animal to tractor power, increased use of fertilizer and lime, the use of improved crop varieties, the increased use of cover crops and other conservation practices, pest and disease control, and better feeding of livestock, shows that influences other than weather account for most of the wartime increase in output. Even with just average weather, production of marketable farm products immediately after the war will be from 25 to 30 percent greater than it was before the war.

Farmers adopted improved practices to an extent in the war years that could not have been predicted from prewar trends. Financial and patriotic incentives brought about almost a technical revolution. For example, use of commercial fertilizer plant nutrients in 1944 was 85 percent above the prewar (1935–39) average. Use of lime almost

tripled. Acreage of winter cover crops increased more than threefold, and other conservation practices came into use extensively. Adoption of improved varieties such as hybrid corn, the shift to intertilled crops such as soybeans, peanuts, and corn, and a pronounced shift from grass hay to legume hay, resulted in notable production gains.

Livestock feeding practices showed great improvement, both in the use of high protein feeds and in the balancing of concentrates with roughages. Livestock output is still far above prewar levels. Since the fall of 1943 it has been maintained only to a very moderate extent by drafts on feed grain reserves and grain imports. Most of the increase has resulted from current production of grain, hay, and pasture. Meat and milk production have benefited greatly from a more adequate balancing of rations, and this balancing will tend to persist.

Technical progress of the kinds above mentioned may be expected to carry over strongly into peace years, since it reduces production costs. The wartime increase in mechanical power will probably continue. This is the continuation, of course, of a long-time trend, beginning with the World War I years. Since 1920, the shift to mechanical power on farms, paced by a decline in the number of work animals in cities, has released about 50,000,000 crop acres formerly required to produce feed for work stock. This land is now producing foods and fibers. Mechanization advanced in the war years despite restrictions on farm-machinery production, with the result, for example, that on January 1, 1945, the number of tractors on farms was 12 percent greater than on January 1, 1942. Probably farmers will buy new tractors and other equipment in greater quantities than ever when the supply permits. Such machinery, besides saving labor on the farm, saves time when time is precious, as in seeding or harvesting.

"Increase" Factors Strongest

Probably some of the wartime increase factors will be stronger when war is over, mechanization particularly. Substitution of tractors for work animals may release as much as 10 million additional acres of cropland by 1950. This will have a favorable influence on yields, because it will facilitate more thorough tillage and more timely performance of crop operations.

Farmers may use fertilizer in greater quantities. Many of them have had a very profitable experience with fertilizer; they would have used more in the war years had more been available. Under prosperity conditions, as shown elsewhere in this report, it would pay most farmers to use more fertilizer and also more lime. Certainly, the increased use of fertilizer will not disappear when the war is over; nor will the greater use of winter cover crops and other soil-improving practices.

Use of improved varieties, after an initial expansion, tends to level off. For example, the percentage increase in the use of hybrid corn may be expected to decline. But the plant scientists, through experimentation with additional crops, are constantly providing new opportunities. Livestock raising will undoubtedly continue to make more use of balanced rations. Some decrease factors, notably conservation reasons for reducing the acreage in intertilled crops and for

restoring some land to permanent grass cover, will not substantially change the balance of forces.

On the whole, the technical forces on the increase side are much stronger than the forces on the decrease side, though how they will operate depends greatly on the postwar level of farm prices. With returns fairly satisfactory in the immediate postwar years, farm production for the market could rise by say 1950–55 to possibly 45 percent above the prewar average. Under depressed conditions, with farm incomes low, the production forces would be weakened. Necessarily, under such conditions farmers would purchase less labor, fertilizer, and machinery.

Even so, they would continue many recently adopted improved practices, especially those that mean a lower cost as well as an increased volume of production. Some improvements, for example, better ways of harvesting hay, tend to reduce costs without significantly affecting output. But they release labor for other work.

It should be remembered, too, that agriculture's fixed costs are high. Farmers must often maximize their production in order to meet these costs, even if prices fall. Farmers did so in the depression years 1930–33. Once the level of farm production has increased, it tends to remain high; it is relatively unresponsive to price-declines. After the farm investment has been made, it tends to be used, almost regardless of changes in the price-level; this applies to equipment and machinery, as well as to land. Farm productivity will unquestionably have great momentum in postwar years.

Allowance for decrease factors, other than those of possible depression, cannot be heavy. Farmers will not want to work so hard when the war is over. Some of the wartime increase in livestock production was cyclical; it may have a reaction. The wartime increases in production have involved great expansion in soil-depleting crops; some curtailment may be in order here. However, higher yielding and higher protein legume hays are likely to replace the grasses with less loss than would otherwise occur. The desire of farmers to work less may not stop them from hiring labor, though it is not likely labor can again be hired at prewar wage levels. Liberal allowance for "decrease" factors still leaves a clear prospect of large production after the war, especially in livestock produced in the humid areas of the country.

Adoption of improved practices may go on with little reference to prices because frequently it reduces costs more for the individual farmer than it increases the volume and reduces the prices of farm products. An increase in the volume of production is not an early but a late result of the adoption of improved practices. In the early stages, the farmers who adopt new practices may have both lower costs and larger output. Some time may elapse before the adoption becomes general enough to increase production and reduce prices; even then, it may leave a credit balance for agriculture, through its effect on production costs. Ultimately, through competition, the advantage of the decrease in unit costs may pass wholly to non-farm groups. Producers may continue, however, to adopt improvements that increase yield per acre or output of meat and milk per animal unit, especially when they can do so without much additional labor and equipment.

Technical Progress Complicates Adjustment

Thus technical progress, accompanied by high production, presents a critical problem for agriculture. Unless demand increases along with supply, technical improvements that reduce the costs of production may eventually benefit only nonfarmers. Prices may decline more than costs—in which case agriculture will definitely lose. Furthermore protection from this danger cannot be had for any length of time through production controls for the whole gamut of agricultural enterprises. The total volume of farm production cannot be restricted unless farmers are willing to subject themselves to a greater degree of regimentation than has ever been experienced in this country.

Our adjustment program in the 1930's applied to particular commodities, rather than to farm production as a whole. It sought to divert land from crops such as corn, cotton, and wheat, into other crops, especially those that would conserve the soil. Obviously, such a program would not correct general over-production. Some shifts in production will be necessary after the war; but these will consist largely of substitution of one crop for another, accompanied by improvements in farm practices. They will not restrict production as a whole.

This Department recently cooperated with State agricultural agencies in an attempt to estimate what changes in the level and pattern of production and in farm practices would be best for farmers over a period of years from the twofold standpoint of current income and maintenance or improvement of the farm plant. The investigators suggested cropland at about the 1944 level. With improved practices, this acreage would result in a level of production considerably higher than that of 1944.

Fortunately for farmers, hopeful elements exist on the market side. Food needs for relief are urgent. Millions of people are hungry. The inevitable waste of both food and other resources in wartime leaves fearful shortages. The world wants the food that is produced now just as it wanted the food that was produced before the war. The problems are largely how the needed food is to be paid for, and how channels of distribution may be opened. Though difficult, these problems should not be insoluble.

As relief needs taper off, food consumption in the United States can be increased, provided the purchasing power of consumers is maintained. This increase in consumption will be largely in foods, such as milk, meat, fruits and vegetables, which require a large amount of farm resources per unit of production and utilize a relatively large part of the farm plant. Increased domestic consumption within the next 5 or 6 years could fill the gap between wartime production and wartime domestic consumption.

Need for Bigger Markets

If agricultural output increases above wartime levels, however, additional market outlets will be necessary. These must be sought in expanded industrial uses for farm products and in larger exports. Expanded industrial utilization of farm products presupposes high industrial activity, just as increased domestic food consumption does.

But it also depends on technological advances, and on development of pricing policies that will encourage new industrial uses. To find a market in industry, farm products often sell at prices that will make them the cheapest source among alternative raw materials.

Export outlets for farm products will depend on the kind of a world we help to build. As the world's most powerful nation, we have a large responsibility for developing adequate world trade arrangements. Possibly we can exceed the prewar volume of exports in some of our important farm products, if we are willing to accept payment in the form of commodities from other countries. Our nonfarm exports will help farmers. Part of the domestic market for food products comes from exports of manufactured products, the making of which employs workers and distributes buying power.

Farm prosperity is dependent on the adoption of broad national and international policies that will permit a high level of national business activity, employment, and purchasing power. If we use our knowledge and experience to maintain high levels of industrial production, urban employment, and international trade, agriculture will be able to sell profitably a relatively high output. Otherwise, farm income and purchasing power will be restricted, and agriculture will have to struggle again with surplus problems.

FOOD THROUGHOUT THE WORLD

Total 1945–46 world output of food in calories may be about 3 percent less than the prewar average. Considering what the world has been through, this looks like a small reduction. But allowance must be made for population growth. On a per capita basis, the 1945–46 world food production may be 10 percent below prewar production, or enough lower to make a very serious food situation apart from other difficulties. Moreover, the international distribution will be very unequal; some countries, notably those of the western hemisphere, will have more food than they had before the war, but others will have much less. World stocks of many durable foods, such as rice, fats and oils, and sugar, will be extremely low. Even wheat, though available in a quantity above the prewar average, will be in smaller supply than during the war years.

These and other outstanding facts about the world food situation appear in a survey recently completed by this Department's Office of Foreign Agricultural Relations. The survey was based on regular agricultural reports from foreign governments, on special reports sent by United States officials stationed abroad, and on information collected by United States officials who traveled widely. Food production has declined most in continental Europe (not including the Union of Soviet Socialist Republics) and North Africa, partly as a result of drought in these regions, along with difficulties caused by the war. Probably the output in continental Europe and North Africa combined will be as much as 15 percent below that of 1943–44 and as much as 25 percent below the prewar average. Food actually available for consumption has declined somewhat less than the production, because of rigid economies in food utilization such as a higher cereal extraction rate in flour milling.

Lessened food production, combined with transportation difficulties and with some tendency for food-collection systems to break down, threatens widespread hardship and suffering in Europe. As usual in the aftermath of war, the towns and cities will suffer most. This is a result not only of the fact that country people have the first chance to satisfy their food wants, but also of the fact that war disrupts trade between town and country. Farmers may have more food than they need themselves and yet be unwilling to part with it for what they can get in exchange. Action to move food from surplus countries and areas to deficit countries and areas will be indispensable if actual starvation is not to occur in many urban centers. Cereals, fats, and sugar are the most urgently needed products.

Food conditions will be below normal in the Orient as well as in Europe. Production will be low, not only in the areas formerly occupied by the Japanese, but also in Japan. Food output in Japan has declined nearly as much as in continental Europe. Japan, like continental Europe, is partly dependent on outside food supplies—in prewar years it depended more on food imports than continental Europe did. As in Europe, the food crisis in the Orient comes from shortages of fertilizers, draft power, and manpower, and from a breakdown of normal trade. Rice production, for example, is much below prewar level in the surplus-producing areas of southeastern Asia as a result partly of the above-mentioned shortages and partly of the loss of outside markets.

In the Union of Soviet Socialist Republics food production has increased in the last 2 years, though it is still much below the prewar average. Russian food supplies for 1945–46 will be slightly larger than in 1944–45, and considerably larger than in 1943–44. Large areas of the Soviet union were under German occupation in 1943–44; the country's food supply was then probably at the low point of the war period. The current improvement reflects not only increased production in Soviet territory, but also the availability of some supplies as reparations from conquered countries. Food is now moving into Russia, whereas in 1943 it was moving out—to German and other Axis countries.

Production in Western Hemisphere

But the Western Hemisphere is the only major region where food production is much above prewar level; it is consequently the only region capable of substantial exports. Production in North America in 1945, though less than in 1944, was about one-third above the prewar level. In South America, where extensive drought prevailed, the production for 1944–45 was about 7 percent above prewar. It is too early to forecast 1945–46 production in South America; in most South American countries the crops are only just being planted. Early indications in the Southern Hemisphere as a whole are favorable. Production in India and China is about equal to that of prewar years; these countries combined produce and consume nearly 40 percent of the world's food. Nevertheless, they have a serious food problem because of the increase in population. Food production in the British Isles in 1945 may be nearly 40 percent above prewar production, though

slightly less than in 1943. Needless to say, the British Isles is not a major food-producing region, and still must import food in large quantities.

World supplies of nearly all major food products will be extremely short during the coming year. Production of wheat throughout the world in 1945–46 may be about 7 percent below prewar, but the exporting countries have large carry-over stocks. Total world supplies will be about equal to the prewar average. They will provide enough for minimum relief needs, however, only if the shortage countries continue their high extraction rates for flour milling, and if the world's diversion of wheat from food to feed uses does not run high. Liberated and deficit rice areas of Asia face a serious rice shortage. Sugar production in 1945–46 will be 13 percent below prewar but slightly larger than the crop of 1944–45. Total supplies will be smaller, because operating stocks have been reduced. The fats and oils supply will be lower than in the previous year largely because of sharply reduced hog production in the United States, Canada, Argentina, and Europe. Liberation of the East Indies and of Manchuria promises some early relief of the world shortage of fats and oils. Some supplies should be available from these areas as soon as shipping can be spared.

Meat Products Below Prewar

Meat products on a world basis will be about the same as in 1944–45, and considerably short of prewar levels. Moderately increased production of meats in New Zealand and Argentina is about offset by further slight declines in United States, Canada, Europe, and Australia. Several countries in northeastern Europe are trying hard to increase their livestock production, subject to handicaps such as difficulty in importing feeds and an increased diversion of food grains and potatoes to food uses. Fish supplies remain much below the prewar level, though recently the world catch has been increasing and further increases are in prospect. World milk production in 1945 may be about 5 percent below prewar, owing to a sharp decline in Europe's production. Consumption of fluid milk and of dairy products other than butter will be above prewar, whereas the quantity of milk converted into butter will be somewhat smaller. The demand for all dairy products is strong, because of the general shortage of other foods. Poultry numbers have declined heavily in Europe. Egg production has been sharply increased in the United States and Canada, and a still higher output is in prospect.

THE FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

In May 1943 the representatives of 44 nations met at Hot Springs, Va., at the invitation of the President of the United States, to consider the establishment of an international food and agriculture organization. In attendance at the conference were world authorities on agriculture, food, and nutrition, all of whom agreed that much could be done to improve levels of living throughout the world by cooperative international action.

On the recommendation of the Hot Springs Conference, the United Nations Interim Commission on Food and Agriculture was set up in July 1943. This body, made up of one representative from each of the countries represented at the conference, was to work out plans for a permanent organization which would deal not only with food and agriculture but with forestry and fisheries as well.

Assisted by a number of technical committees on science, economics, nutrition and food management, agriculture, forestry, fisheries, and statistics, the Interim Commission in January 1944 completed its first draft of a constitution for FAO. This was forwarded to the 44 governments for comment and suggestions. In July 1944 the final draft of the constitution was sent to the member governments for approval. Within a year it had been approved by more than 20 governments—the minimum number required by the constitution before the organization could be established—and plans were being laid for the first conference of FAO at Quebec, Canada, in October 1945.

Institutions and policies will be in the flux of transition from war to peace. New international arrangements will be in the making, and it will be easier for governments to start in new agricultural directions before old ways of thought and action become reestablished. The needs of many countries for food, equipment, livestock, seeds, and other supplies are urgent, and technical assistance will be required if improved production methods are to be used. On the other hand, in countries such as the United States, where production has been pushed to high levels to meet wartime needs, farmers are already beginning to worry about the possible accumulation of surpluses.

One of the objectives of FAO will be to lay the foundations for mutually advantageous adjustments and cooperation so that the needs in one part of the world may be balanced insofar as possible with the overplenty in another. If the economic chaos of the period between the two world wars is not to be repeated, international assistance of the type FAO proposes would seem to be highly necessary.

This objective would be part of a broader, longer range goal: The achievement of higher nutritional levels among all the member nations, and indirectly among all nations. This will be promoted by FAO through extensive international collaboration to improve production and distribution of all the products of the soil and sea. By study of both producer and consumer needs, FAO will try to find ways whereby production and consumption may be expanded together, without periodic interruptions or serious lack of balance. Naturally, this is a long-time program; but it cannot even be approached except by such an international approach as FAO proposes.

First Problems To Be Faced

During its first years FAO will undoubtedly turn much of its attention to countries seeking to rehabilitate their agriculture from the ravages of war. The actual meeting of needs for relief and rehabilitation will be UNRRA's responsibility, but in many cases plans for rehabilitation will have long-range significance. This will be es-

pecially true of countries where food is perennially short of people's needs. In these plans close cooperation between UNRRA and FAO will be essential if the immediate rehabilitation is to have permanent value.

The Interim Commission suggested in advance of the Quebec Conference that one of the first actions of FAO would be to promote national nutrition organizations in as many nations as possible. This action is desirable because, even under unfavorable conditions, and at existing economic levels, the diets of large population groups can be bettered by applying nutritional knowledge. To undernourished or seriously ill-nourished peoples, even a slight advance can mean a considerable gain in health.

The Food and Agriculture Organization is likely also to begin at once to make the best possible appraisal of production, exports, imports, and consumption of major commodities in all countries, since this will provide the only sound basis for advice and assistance to member governments in adapting their production to changing world conditions and for helping them integrate cooperatively their production and consumption needs.

In all its work, FAO will have to rely on the cooperation of the member governments. Its functions will be primarily advisory and educational. It will lack funds to assemble the data it needs except as member governments make information readily available; and it will lack any means of carrying out its recommendations except as the member governments voluntarily institute the policies and programs it recommends. Hence, in the United States, if the purposes of FAO are to be achieved, a large part of the work of meeting FAO's objectives as they apply to the United States will devolve upon the United States Department of Agriculture; and it will be the policy of the Department to cooperate whole-heartedly with FAO within the limits of its legal authorizations.

In most cases this will mean simply a speeding up or expansion of many programs already under way, and a cross-checking with FAO to see that the programs are not in conflict with those of other countries to the extent that they are internationally self-defeating.

By accepting membership in FAO the Government of the United States has agreed to report periodically on the progress made toward achieving the Organization's purposes. These reports to be most useful should be detailed presentations of the entire status of agriculture, including forestry and fisheries, and of levels of nutrition, in the respective countries. Undoubtedly the task of collecting and interpreting the basic data for these periodic reports from the United State Government will fall to the Department of Agriculture. This will require expansion of the Department's fact-finding and analytical work, but such expansion has long been needed. The additional data will be even more useful to the people of the United States than to FAO; and in addition we will have access to similar data compiled by FAO from all the member governments. A vast improvement in world statistics on agriculture and nutrition and in understanding of perplexing international-trade problems of vital concern to American agriculture, should result.

Broader Commodity Agreements

For example, action to deal internationally with world surpluses has been largely confined heretofore to the use of international commodity agreements, such as the wheat agreement, the coffee agreement, and the sugar agreement. Frequently, the accent has been on production control and price maintenance. But if the purpose is to promote an expanding world economy, this is plainly not sufficient. It neglects the requirements of underprivileged peoples and of importing peoples. Action to deal more constructively with surplus problems of this nature through international commodity agreements calls for a much broader international frame of reference in which the importing nations will rank with the exporting nations. Obviously, the first step is to bring them all together in the consultive process and lay before them the most complete and reliable information on consumption needs and production possibilities that can be provided. FAO's facilities will be indispensable for this purpose.

Cooperative world action to eliminate surpluses must attach more weight to consumption, not only because ways and means of stimulating consumption have not heretofore been studied sufficiently, but because efforts to remedy surplus situations by action exclusively on the supply side cannot succeed. The forces of production are too strong, too competitive, and too widely diffused. The real answer to tremendous production is tremendous consumption.

Many nations have taken steps individually to raise the level of consumption among their people, but the events of the interwar period have demonstrated that isolated action is not enough. Application of the principle cooperatively, on a world scale, seems to be desirable. Around the conference table, with buying and selling countries equally represented, plans for moving production into consumption can be worked out with far better prospects than would attend the efforts of the nations separately. FAO is in a position to make or to facilitate the necessary world analysis, without in any way transcending its function as an advisory body, and in cooperation with other international organizations concerned with trade and finance to evolve international policies and programs mutally acceptable to the various governments concerned.

These, to be sure, are knotty problems which FAO alone cannot hope to solve. It can, however, contribute much to their solution by assembling the essential facts on which a workable solution must be built. Meanwhile, FAO will devote much of its attention to the more regionalized problems of increasing production in those countries where population presses relentlessly against the means of existence.

Ultimately, FAO may be able to devote most of its attention to cooperative international programs for increasing production everywhere. On a world scale, and from the standpoint of human needs, this is the main hope. It depends for its realization on a combination of many factors, among them facilities for promoting international trade, for maintaining urban employment, for matching farm production with marketing and processing, and above all for keeping the peace. When FAO finds itself in a position to emphasize technology rather than distribution it will be over the first major hurdle.

Within agriculture the world over, the main factor is still technological, for throughout most of the world agriculture is still primitive. But technical shortcomings in one place, we have discovered over the years, do not work out to the advantage of the more advanced farmers elsewhere. On the contrary, the main effect of technical backwardness is simply local poverty, in no way compensated by local power to buy the products of more advanced regions which must sell in order to prosper.

In proportion as other agencies strike the shackles off the world's economy and provide scope for expansion, FAO will be able to emphasize its over-all objective—that of assisting people everywhere to make the earth yield more abundantly.

AGRICULTURE'S NEED OF WORLD TRADE

Agriculture after the war will need a high level of international trade, primarily as a guaranty of world security and peace, the foundation of all welfare; and secondly, as the basis for profitable production and marketing. The alternative is relative isolation, which involves enforced uneconomic changes in farm and factory systems. If we want to keep our comparative advantages in various lines of production, and at the same time to let other countries keep theirs, we must have expanding international trade, with imports as well as exports increased.

Trade and peace are interdependent. The interwar years showed the connection in reverse. As political insecurity increased, trade among the nations declined. These developments were cause and effect reciprocally. On the one hand, political insecurity damaged world trade by the incentive it gave some countries to strive for self-sufficiency in foods, clothing, and other basic goods. On the other hand, self-sufficiency programs added to the prevailing political tension, through the additional hardships, economic conflict, and suspicion they engendered. In turning its back upon trade, the world turned its face toward war. Now, it must face about, and adopt programs that will promote trade and peace together.

Farmers everywhere, and especially the farmers of the United States, have a stake in this. Farmers, it should be borne in mind, have a majority interest in peace from a world standpoint, since farm people comprise 2 out of every 3 people on earth. They want peace for the same reason that other rational people want it; namely, as an assurance that they can get on with their proper business in life. Peace means larger outlets for farm products, ultimately if not immediately. Moreover, it means safer outlets, where buying power will rest on constructive and not destructive activity. In exchange for this most farmers would gladly trade war booms. Peace coupled with easy, abundant, and reciprocal world trade promises a better assurance of farm prosperity than can be obtained in any other way. Specifically, it means readier access by farmers everywhere both to markets and to necessary sources of supplies.

From a purely business standpoint, agriculture will need foreign trade because it will be producing more of some products than it can

sell to United States consumers at a remunerative price. It has an interest also in exports of factory products; such exports provide employment here and thus broaden the domestic market for agricultural commodities. Though industrial exports, dollar for dollar, result in less increase of farm markets than do agricultural exports, the sale of industrial products in foreign markets is of importance to farmers and will be of increasing importance hereafter. In addition, agriculture has an interest in imports. Healthy permanent foreign trade is necessarily a two-way proposition in the sense that it involves both exports and imports. Besides satisfying wants in the United States, those of farmers as well as of nonfarmers, imports provide dollars that foreigners can use in making purchases here.

Prewar Drift towards Self-Containment

Between the wars United States farms suffered more than United States factories from the drift toward economic nationalism. Agricultural exports declined in total and became a smaller proportion of the value of our total exports; they felt the impact of Europe's self-sufficiency policies, of expanded farm production in exporting countries, and in the 1930's of our own price-supporting measures, which were part of the trade-restriction mechanism. Exports of nonagricultural products increased, except in the worst depression years, largely as a result of technical progress in mass-production industries—though not to the extent that they would have increased under freer trade conditions. Nevertheless, American agriculture continued to be heavily if decreasingly dependent on export trade. Even in the late 1930's we exported about 40 percent of our cotton, about one-third of our tobacco, nearly one-tenth of our wheat, and considerable quantities of rice, lard, and fruits. In the war years, lend-lease took the place of commercial exports and total agricultural exports jumped. In addition, the United States sent farm products abroad for the use of the Army and Navy and for relief purposes. But wartime procedure does not solve the postwar problem.

Obviously, moreover, a high level of international trade cannot be achieved independently of other world objectives. It must be treated simply as an aspect of political and economic policy in general, which must consider all types of domestic and foreign relationships. Ground work must be laid in international politics; more specifically in arrangements to establish, guide, shape, and keep the peace. Necessarily world trade requires good prospects for lasting world peace. Even below this highest level, the world-trade problem is largely a matter of diplomacy; for example, it involves monetary and financial understandings, which in turn involve the entire social and economic fabric. Adjusting tariffs, negotiating international commodity agreements, and getting together for dealing with world surpluses is practically impossible if the nations lack a common monetary standard and a common monetary language. Under such conditions trade pacts have no meaning. Hence the farmer's interest in world trade goes beyond his crops and covers the entire range of necessary political, financial, and commercial policies. It returns, nevertheless, to his crops, the handling of which must mesh with the other phases of the world-trade

problem. This problem should be studied intensively from the agricultural standpoint, lest the need for action find agriculture unprepared.

THE YEAR'S PRODUCTION

Farm production in the United States in 1945 resulted in the largest volume of food grains on record, the second largest volume of feed grains, and the second or third largest quantity of livestock products. Crop and livestock production together was nearly as large as the country has ever produced. Up to the time small grains were mature the farming season was greatly in their favor, though it was less favorable for other crops. Then it became favorable for the late-maturing crops, which previously had encountered unfavorable weather. Harvesting of most crops was accomplished with a minimum of loss.

Preparation of seedbeds in the fall of 1944 was difficult, and farmers had to sow considerable acreages of fall grains in dry ground or later than usual, particularly in the Southern Great Plains, the Pacific Northwest, and to some extent in the Corn Belt. But October rains speeded seeding operations and enabled grains seeded in the dust to germinate. Yield prospects at the beginning of the winter were above average, and early spring conditions further improved them.

Fall-sown grains emerged from the winter in good condition; hay and pastures made an excellent start. By April 1, thanks to an unusually warm period in late March, the seeding of small grains was further advanced than usual. Stocks of feed grains were abundant and liberal feeding, coupled with favorable weather, resulted in record rates of production of milk and eggs. Fruit, early vegetables, gardens, and some other crops, however, suffered from widespread freezing temperatures. Excessive rains and floods over wide areas caused damage and loss of acreage, while cool weather retarded vegetative growth and restricted the germination of spring-sown crops.

One of the coldest Mays on record, with occasional frosts and persistent rains, impaired crop prospects and delayed spring planting operations. Drought developed in the Southeast and threatened to develop in the Southwest. But farmers took advantage of every break in the weather, mustered and pooled available power equipment and family labor, and planted a surprisingly large acreage, though later than usual. Some corn acreage was not planted until well after July 1.

Heavy production of small grain was assured by ideal July weather for filling, maturing, and harvesting of these crops, which offset the factor of lateness. Hay and pastures flourished. Corn, however, developed slowly until favored by warmer and drier weather in August and September. Frosts at near usual dates in parts of the Corn Belt resulted in considerable "soft" and "wet" corn.

Acreages and Outturns

Combined acreage of all crops harvested was estimated in November at 353 million acres. This was only slightly less than in 1944, and was the second largest since the period 1928 to 1932, when the range was 353 to 363 million acres. Farmers could not plant all the planned

acreage of corn, sorghums, and small grains, particularly barley. A big shift took place from row crops to small grains, encouraged by lighter labor requirements for the latter, by favorable planting conditions in late fall and early spring, and by light abandonment of winter wheat. Increased acreages of tobacco, sugar beets, and truck crops were planted, despite high labor requirements. On the other hand, the acreage of cotton was reduced 10 percent from last year to 18,355,000 acres, the smallest acreage of the century. Farmers planted less than the goal acreages of corn, barley, rye, flax, sorghums, potatoes, sweetpotatoes, dry beans, soybeans, peanuts, cotton, and sugar crops. In the aggregate these crops were nearly 12 million acres, or 3 percent, below the goals. Crops requiring large amounts of labor usually did not reach the acreage goals.

A second successive billion-bushel wheat crop was harvested. The 1,150 million bushels produced exceeded the previous record crop of 1944 by nearly 7 percent. The yield, at 17.7 bushels per harvested acre, was well above the average, though it has been exceeded several times. The relatively large proportion of the seeded acreage of winter wheat remaining for harvest as grain, coupled with a relatively large spring wheat crop, were major factors in the record production. The rye crop was relatively small, though yields were well above average. Rice yielded well and produced a record crop in spite of a disastrous tropical storm in the rice area of Texas. Buckwheat production was above average, but below that of 1944.

Corn production, for the fourth successive year, exceeded 3 billion bushels; the corn crop was the third largest of record. The yield per harvested acre was exceeded only in 1942. About 64 percent of the acreage was planted with hybrid seed. This was an important factor from the yield standpoint, and in enabling the crop, which had been planted under adverse conditions, to mature quickly and uniformly enough to escape major frost damage. Frosts occurred at about the usual dates in the northern and western Corn Belt.

Farmers harvested the first 1½ billion-bushel oats crop. Moderate temperatures and abundant moisture in main producing areas prolonged the development period, counteracted the effects of late planting, and resulted in high test weight and a heavy yield per acre, particularly in States with large acreages of oats. Barley, grown on a smaller than average acreage, made the highest yield per acre since 1915, and the production was slightly above the average. Acreage of sorghum grain was limited by relatively light abandonment of wheat acreage in the Southwest, where abandoned wheat land is often replanted to sorghums. On much of the acreage the sorghum crop was planted late. Moreover, it suffered from dry weather and from frosts; nevertheless, although much below the 1944 crop, it was the third largest ever produced.

Cotton production, on the smallest acreage harvested since 1885, was less than 9½ million bales and with the exception of the 1921 crop was the smallest since 1899. Plantings were late and the season was unusually wet. As a result, the growth was rank, and harvesting and ginning extremely slow.

Tobacco, for the first time in history, passed the 2 billion-pound mark. Good growing conditions favored the late crop. Production

of peanuts was more than 2,174 million pounds—near the all-time record. It was 47 percent above the 1934–43 average. Production of soybeans fell below the large crops of 1943 and 1944. Much of the soybean acreage was planted late and the pods did not fill as well as was expected. Dry beans were the smallest crop since 1936, and many of the beans were immature or damaged by frost and rain. Hay, potatoes, and flaxseed were near-record crops, and the outturn of sweetpotatoes was above average.

The citrus crop promises to be a record. Peaches, pears, and sweet cherries were record crops. On the other hand, apples and sour cherries were record lows. Together, the citrus and deciduous fruit crops were about 4 percent less than in 1944, but 18 percent above the average. Production of tree nuts was slightly less than in 1944, and about a third more than average. Production of commercial vegetables for the year set a new high record; it was at least a fourth above average. Output of vegetables grown for processing exceeded the average by more than 40 percent. Seed crops suffered from unusually wet weather at harvesttime; yet the production was above average, and indicated relatively few seeds would fall short of 1946 requirements.

Total food-grain production was 37 million tons—2 million tons more than in any other year. Total feed grain production was 121 million tons. Together with the big hay crop and a large tonnage of other roughages, it gave a feed supply exceeded only once before—in 1942. At the beginning of the October feeding season, supplies of feed per aninmal unit were the largest in the 20 years of record. Pastures and green feeds were abundant until a late date.

Production of livestock and livestock products in 1945 was at about the same level as in 1944—only 5 percent below the all-time high of 1943. It was estimated that approximately 45 billion pounds live weight of cattle, hogs, sheep, and poultry would be produced in 1945, or about 6 billion pounds less than the 1943 production and slightly less than that of 1944 or 1942, but substantially more than that of any other year. Milk production promised to establish a new record at about 123 billion pounds; production per cow was near the record level. Farm poultry produced eggs at a record rate per layer; but the number of layers averaged 8 percent less than in 1944. Farm production of eggs in 1945 was expected to reach 4.6 billion dozen—second only to the 1944 record.

Rationing Ended Except for Sugar

On December 1, 1945, the wartime food rationing program ended, except for sugar. Because of a serious worldwide sugar shortage, there was no immediate prospect of lifting sugar rationing. The decision to lift the rationing of the other foodstuffs was made possible by changes since VJ-day in food requirements and supplies, notably sharp reductions in military takings, seasonal increases in livestock slaughter, an increase in the production of chickens and turkeys to an all-time high level, and prospects for a record supply of eggs. Supplies of meat available to United States civilians for the month of December 1945, were estimated to be at an annual rate of 165 pounds per capita, as compared with the prewar (1935–39) average of 126

pounds. This was after allowing for military needs and for set-asides to provide more than 30 million pounds weekly for shipment to allied and liberated countries plus a substantial amount for commercial export. Allowance for the taking of a substantial tonnage by UNRRA would still leave supplies above the quantities that would necessitate continued rationing.

In 1946, the civilian meat supply will continue favorable, though with some tightening in the second and third quarters. Fats and oils, will continue in short supply; but discontinuance of the rationing of these commodities in the United States appeared to be preferable to the institution of a completely new system of rationing for fats and oils alone, such as would be necessary with meat rationing terminated. Such a new system would involve the registration of more than 500,000 industrial and institutional users and the possible issuance of new ration books to all civilians. Allowing conservatively for exports of fats and oils for essential relief purposes, the Department estimated civilian supplies of fats and oils in the first half of 1946 might be nearly 10 percent below the prewar rate.

Consumption of fats and oils in war-ravaged countries will continue far below prewar levels for some time, and it will be essential to fill the minimum needs of these countries. Besides making some supplies available from the United States for this purpose, the Department was acting to obtain all the vegetable oils possible from the recently liberated Far Eastern areas. It was on the lookout for supplies which might be available elsewhere, and was improving the collection and procurement machinery. Also, it was urging continued effort to prevent waste and to salvage waste fats. Meantime, set-asides for Government procurement and the allocations program for dividing up supplies of fats and oils were being continued.

COTTON AND THE FARM ECONOMY

More than half our farm people live in the 13 Southern States, and about half the South's 3 million farm families get most of their cash income from cotton. These southern farm people, however, have among them less than one-third of the Nation's cropland; pressure of population upon the land supply is greater in the South than in any other section. Moreover, they receive only about one-fourth of the Nation's farm income.

Evidently we have here one of the biggest and most difficult economic and social problems. It comes to public notice largely in terms of cotton. Actually it has a much wider basis. Progress for southern agriculture and southern farm people cannot be achieved in terms of cotton alone; it requires attention simultaneously to many other crops as well, and also to the development of markets, partly through greater industrialization of the South.

Nevertheless cotton is still, and will long continue to be, the South's key crop. If we cannot deal effectively with cotton in postwar years, we cannot expect to improve the general level of southern agriculture. Because the South's problem begins with cotton, though it does not end there, we need to look carefully at available and possible means of putting cotton on its feet.

The foreign aspect demands earnest attention. Heretofore in peacetime we have depended upon countries overseas to take half or more of our crop each year. When our customers abroad have taken less, our stocks have piled up. It has been obvious in consequence that we could not solve the problem at home unless we solved it abroad. The alternative was the effort to cut back our production to fit our own consumption plus available world markets.

This is where we stood when war came to Europe in 1939. The war almost suspended our export trade as such. We continued, however, to send some cotton abroad as lend-lease aid and greatly increased our own mill consumption to supply the United States armed forces. In this way we disposed of our wartime crops. Our surplus of cotton, though it remained large, did not materially increase.

But now we again face the cotton-export problem in a form more difficult than any we have known. We must find overseas customers who are able to pay for our cotton.

Over many years the quantity of cotton, American and foreign combined, which moved in peacetime from producing countries into world trade approximated 13 million bales. In the war years the volume shrank to 4 million or less. Victory is now reopening world-trade channels, but it does not automatically assure restoration of the world's trade in cotton. Markets for cotton abroad have suffered from physical injury to cotton mills and also from general impairment of the economic order. For example, our allies have incurred debts that depress their standards of living and impede resumption of their purchases. Aggressor countries have brought ruin upon themselves and involved many other countries in disaster.

The relief total of cotton sent abroad will not be large. This country, however, will undoubtedly lend funds abroad in considerable amounts as it did after the last war. Such lending and other palliatives will help to restore markets; but until our former customers can build up their external purchasing power we must expect them to restrict their imports of cotton and to continue to depend heavily upon synthetic fibers.

Cotton Moving into Export

Cotton is now moving into export in a volume which, in view of the economic and commercial disorganization abroad, must be considered encouraging.

The end of the war found the continent of Europe bare of cotton and industry almost at a standstill. Rehabilitation of Europe's cotton industry has been retarded by the coal famine, but progress is beginning. Takings of cotton by France, Belgium, and the Netherlands have far outrun consumption in these countries in recent months, and the purchase programs of these countries up to July 31, 1946, call for imports considerably above their probable consumption for that period. Shipments to the United Kingdom are largely in abeyance, pending completion of the loan negotiations now under way.

Moderate amounts of cotton have been shipped to Italy; larger shipments await the completion of financial arrangements. American cotton is also being supplied through UNRRA to Czechoslovakia,

Greece, Yugoslavia, Poland, and China. Czechoslovakia is planning to supplement its takings from UNRRA with sizeable purchases when credits now under consideration have been arranged. China's program is similar.

Germany and Japan have received no American cotton since their respective surrenders; the import programs of these two countries remain to be worked out, in keeping with the higher policies of disarmament and administration of ex-enemy countries. Some cotton is expected, however, to move soon to each of these countries. A small initial supply has in fact been arranged for Germany.

In the case of Japan, plans are under consideration which may permit a resumption of activity on a scale which, though much below prewar levels, will supply Japan's own requirements and permit some export of textiles.

Growth of World's Cotton Stocks

This prospect emphasizes the gravity of the cotton-supply situation. World stocks on August 1 were close to 26 million bales, or more than a year's consumption at the current rate. The oncoming crop, added to their carry-overs, will give cotton-producing countries more than 20 million bales for export, after they have allowed for all domestic requirements for consumption and working stocks. This is more than double and possibly three times the total world-export trade that now seems probable in the current year.

Two important facts should be noted. First, before the war the United States held the bulk of the world cotton surplus; now every other exporting country of importance has an unprecedented surplus. Secondly, former efforts by the United States to uphold prices made it easy in some years for other countries to undersell us abroad; but we are now in a position, under the Surplus Property Disposal Act, to export cotton at competitive prices. By means of its export program and its credits this country could get a very large share of the reduced world trade in cotton.

Temporarily, such a course would move part of our surplus and discourage cotton production in other countries. But it would be a dubious procedure in the long run. For example, it would raise doubts as to the sincerity of our efforts to resolve world difficulties through international cooperation.

This Government has been quick to assure the governments of other nations that it seeks no unfair advantage and wishes only to offset its handicaps in the international market. These have partly resulted, it should be noted, from measures the United States has taken internally to improve cotton prices—measures that have benefited foreign as well as American cotton growers. Hence, while insisting upon the right to retain its domestic and export programs, it has offered to negotiate an arrangement with other countries by which they may be protected from untoward or unintended consequences. The arrangement would provide for an equitable sharing of the international trade and for concerted action in dealing with the surplus. Preliminary discussions are under way.

Basically, the South wants a method whereby it may continue to sell cotton both at home and abroad and at the same time earn a satisfactory farm income. Cotton producers have been dependent on price-supporting measures which involved an increasing loss of trade, especially in the export field. Permanent cotton policy must avoid this dilemma; it must support southern farm incomes by means that do not involve a loss of markets.

Adjustment to Increasing Efficiency

Necessarily, the policy must aim at many other objectives too, such as continued progress in farm technology, soil conservation and soil improvement, the provision of better marketing facilities, and advancement in rural health, rural housing, rural electrification, and rural education. It is particularly important to have maximum farm efficiency, which does not necessarily mean blind maximum production of every product in every area. It does mean relatively low-cost production, without which good prices may not ensure good incomes. Better seeds and stock, better machinery, more lime and fertilizer, and other aids to high production per acre and per man-hour do not conflict with the desire of farmers to obtain good prices for their products. On the contrary, technical farm efficiency makes price maintenance easier, because it accords with efficient total farm management, which includes the adjustment of crops to a desirable pattern of production.

In any event the trend toward greater efficiency in agriculture will continue. Our problem is not to halt the trend, in the false belief that left unchecked it inevitably creates surpluses, but to fit it harmoniously into a many-sided general farm program, so that the demand for different crops can be met without waste of human or material resources, and with output properly balanced along different lines in the light of total requirements for food and fiber.

Recent and prospective innovations promise to revolutionize cotton production. If any area does not keep up, it may lose the benefit of other action taken to improve the position of cotton. Soil preparation and cotton cultivation by mechanical power are common already. In the High Plains area the use of four-row tractor equipment can reduce the man-labor requirement to as little as 4 or 5 hours per acre up to harvesttime, and the use of a mechanical two-row stripper in place of hand snapping achieves a further important reduction in the man-labor requirement.

By means of these devices the labor requirement for the entire job of producing cotton can be held down to about 8 hours per acre, or one-third of what it was formerly. In the Mississippi Delta, complete mechanization of cotton production with the help of a mechanical picker has experimentally reduced the labor required to one-fifth of what is necessary with mule power and hand methods. It should be kept in mind, however, that the further mechanization of cotton production will necessitate some transfer of labor to other work.

Widening of Farm and Nonfarm Opportunities

It is impossible to stop the mechanization of cotton production, and we should not try, but we should develop a program for employing displaced southern labor. One opportunity is greater industrialization of the South. More urban jobs will benefit the South's farmers, as well as its surplus farm population, through the growth of nearby markets for milk, eggs, fresh vegetables, and fruit. In short, local industrialization will provide more work on as well as off southern farms; it will give farmers more chance to supplement their cotton growing with other farm enterprises. Forestry is one of the alternatives which southern industrialization would encourage.

Simultaneously, the development of industry and business in the South will improve the market there for cotton. The South consumes too little of its own major agricultural product. With better incomes and better living standards in the area, the local market for clothing, mattresses, sheets, towels, and other household textiles would greatly improve. Paradoxically, the consumption of such goods in the South has been too low precisely because its production of cotton has been disproportionately high in relation to the total market demand.

More diversity in the South's economy, both on and off the farm, would actually lessen the need to move away from cotton. Especially helpful would be increased attention in the South to new techniques in cotton processing which open the way to important new uses for cotton.

Competitive Materials Outlook

Probably no marked change in the demand for cotton will take place during the next year or two as a result of competition from other materials.

Over a longer period, however, the opposite may be true. The inroads made during the war by competitive materials into such important uses of cotton as tires and bags may increase. Much will depend, of course, on action taken to strengthen cotton's competitive position. Cotton should be priced as favorably as possible, research should be conducted to improve the physical and chemical properties of cotton products, and informational work should emphasize the advantages and adaptability of cotton.

All possibilities for reducing costs should be explored—on farms and also in ginning, marketing, and processing operations. Substantial reductions can be made. They would materially enhance cotton's competitive position and would largely determine whether or not it can meet the competition of substitute materials.

Core of the Cotton Problem

Essentially, the cotton problem turns on how much cotton the farmers should grow and on what they should expect to receive for it. Partly, of course, it is a Government problem, because the Government has been helping farmers to deal with it for some years and must necessarily do so under postwar conditions. Programs and policies can be imagined in a great variety of combinations, but the basic alter-

natives are few. We can rule out the extreme opposite proposals. It is not practicable to peg cotton at a legally determined parity price for all the cotton the South can produce and let matters take their course. On the other hand, it is surely not practicable to abandon all Government support for cotton and let cotton incomes fall to some disastrously low level. Policy must crystallize at some point between the two extremes, in terms of a decision as to whether we want a relatively high price for cotton with a relatively small market or a lower price with a larger market.

Why it is not practicable to peg the price at parity for all the cotton the South could grow is evident. On such a basis only a part of the crop, and perhaps only a relatively small part, could be sold. This price would probably be far above the level at which American cotton could be marketed abroad, and also not favorable for attempts to resist competition from the synthetic fibers in the domestic market. With cotton production sharply restricted, the crop might be held at parity; but growers would have to accept extremely small acreage allotments. Otherwise there would be heavy piling-up of surpluses. True, the country would not want to abandon all its foreign market for cotton. Exports, however, would have to be subsidized to the extent of the difference between the domestic prices and the world price. This would be costly. Also, it might lead to reprisals by other nations. Besides dumping cotton abroad, we would have to prevent foreign countries from dumping cotton here. This might provoke a retaliatory use of subsidies, tariffs, and embargoes.

Objections to Dumping

Moreover, such a policy would involve many complications. For example, in addition to the cotton export subsidy it would probably require action to prevent a serious decline in the domestic consumption of cotton. Large sums might have to be spent to subsidize new uses and to help low-income families buy more cotton goods. It would be necessary to have marketing quotas. In carrying out these different requirements the Government would become involved in day-to-day decisions in the marketing of cotton both at home and abroad, and might find itself carried eventually toward heavy Government purchase and sale of American raw cotton.

Parity for Part of the Crop

One possible approach to the cotton problem would maintain a parity price only for the domestically consumed portion of the crop. For the export portion the growers would receive the world price. This would be arranged pro rata. For example, if two-thirds of the crop entered domestic consumption and one-third went abroad, each grower would receive parity for two-thirds of his individual production and the world price for the remainder. Practically, the farmer would receive a blended or average price, which would be lower than parity unless the world price equalled parity. Ordinarily, there would be no restrictions on the amount he could produce. Surpluses would not accumulate so long as the world market took all we offered

at the world price. If it failed to do so, however, the United States would have to fall back on acreage allotments, marketing quotas, and subsidized domestic consumption.

Possible Shift to World-Market Basis

Another approach would hitch the domestic price of cotton to the world price. Under this condition the average price of cotton would be lower than what it would be were farmers assured of parity for the whole or even for part of their cotton production. They would receive certain Government payments to maintain their incomes. In addition they would have facilities for obtaining Government loans, but only for the purpose of coping with short-term fluctuations in the world price.

This approach would put American cotton in a stronger position to compete with foreign growths in the world market and with synthetic fibers in the domestic market. It would require no special structure of tariffs or import quotas. Cotton consumers here would be able to buy American cotton for the same price at which it was offered to foreign buyers. Cotton farmers would not get all their income in the market place; they would have to depend for an important part of it on annual Government appropriations. However, these payments might tend to perpetuate the situation that made them necessary, since with production unrestricted the payments would encourage production. Furthermore if the spread between the domestic price and the world price were to widen very greatly, the cost of the program might be very heavy.

Plan for Regional Readjustment

Still another approach has been proposed; its advocates emphasize the need for extensive agricultural conversion in the cotton South. This procedure, like that mentioned above, would allow the domestic and the world price of cotton to be the same, and would use Government payments to maintain the income level of the cotton farmers. In this case, however, the payments would extend only over a stated period. One of the purposes would be to help some cotton farmers change from cotton partly or wholly to other lines of production, while other cotton farmers improved their technique and lowered their costs of production sufficiently to be able to cope with world competition at world prices. Along with the conversion to a more diversified southern agriculture would go vigorous effort to promote industrialization and wider markets in the region. This proposal deserves mention here, not as necessarily the one that should be adopted, but as one that should be considered along with the other alternatives.

In one form the so-called conversion approach to the South's problem would use two types of income payments instead of the price supports. One type would be cotton-price adjustment payments, which would bridge all or part of the gap between the competitive price and the parity price of cotton. Based on prewar cotton acreage allotments, these payments would be made to all cotton growers on a diminishing scale for a limited period. The other type of payments

would be contingent on the carrying-out of recommended conversion practices, such as would develop a better system of farming and farm living. The payments would cover labor and other costs of the conversion job, and would be at a uniform rate for given practices within an area. Participation in the conversion plan would be voluntary. I mention this proposal, not to single it out above the others, but simply to include all the main approaches in this brief survey.

It should be borne in mind that the conversion approach presupposes greatly accelerated industrialization in the South. Everyone recognizes the desirability of that, but the plans remain to be worked out. Obviously, the proposal to shift acreage now unprofitably in cotton to other crops requires alternative crop possibilities. Obviously, too, the suggestion that some cotton producers should find nonfarm work implies that such work should be provided. Some alternative crop opportunities could be found in truck crops and dairying and meat production. Shifts into these farm activities would also furnish considerable nonfarm employment, such as that in vegetable-processing plants, creameries, cheese factories, and meat-processing establishments. Other crop shifts would provide nonfarm jobs in collecting, processing, and distributing farm products. Mainly, however, the South would need increased industrialization. In fact it is on this that the whole idea depends.

As to the need for more industrialization in the South, it can be inferred from southern incomes. In prewar years about 50 percent of all our farm workers were on southern farms. Partly in consequence, southern agriculture's net income was barely half as large per worker as the average for the rest of the country. Thus in 1940 the southern farm income averaged $380 per gainfully employed agricultural worker. Elsewhere the average was $710. Southern incomes from nonfarm work were likewise substantially lower than in other sections. Among the causes we may surely include one fact: The South was relatively unindustrialized and had only 65 percent of its workers in nonagricultural work as compared with 87 percent for the rest of the country. Perhaps half the South's agricultural conversion problem is urban and requires important changes and developments in industry. In proportion as the South's industrial prospects look up, the cotton problem will decline in difficulty.

Outline of Possibilities in Industrialization

Considerable opportunity exists for industrialization in the South. For example, the region can undoubtedly expect further development in its cotton-textile industries. Forest-product industries can be expanded. Ceramic clays, feldspar, slate, and other materials provide a basis in many parts of the South for pottery, chinaware, artificial roofing, and other industries. With larger buying power in the South, many industries might be established to serve local markets; for example, in bread making, fluid-milk bottling, laundering, and machine repairing. The field for expansion of various service trades such as gasoline distribution, local transport, amusement, cleaning and dyeing, and hotel and restaurant facilities is very large. Transfer of southern workers from submarginal farming to the above-

mentioned activities would probably raise their average incomes considerably, and in that way improve the market for the remaining farmers. In proportion as the South develops these industrial opportunities, the domination of its income and employment by cotton and tobacco, which characteristically use much labor per dollar value of product, will decline.

Undoubtedly in deciding on a program for the postwar years, the South will want to consider all the possibilities. Whatever the decision, however, it will unquestionably be in the interest of cotton producers and of the nation as a whole to avoid insofar as possible the extreme swings of prices in the world market which have long characterized cotton history. There are now definite possibilities that through international cooperation considerable progress in this direction can be achieved.

WHAT'S AHEAD FOR WHEAT

Conditions in the next year or two may keep our wheat acreage at about what it is now. Our stocks of wheat, and likewise those of other wheat-exporting countries, have been reduced considerably. In the 1945–46 marketing year world trade in wheat may absorb most of the remaining surpluses in the wheat-exporting countries. The price of wheat in the United States in 1945 was the highest since 1925; it was considerably above that of any other exporting country. We have been exporting flour under subsidy, as authorized by section 32 of Public Law 320 (74th Cong.) as amended. Also, we have exported some wheat grain under subsidy. Military and relief needs have increased the overseas requirement. Export takings may maintain export wheat prices through another year at least. Eventually, the export-subsidy authorization may have to be applied increasingly, since maintenance of a large wheat acreage for several years will necessarily raise surplus-disposal problems.

Current Export Demand

The wheat situation, especially the export demand, was a fast moving panorama this season. Exports of wheat and flour were high, though with shifts in the countries involved. In the spring and summer our exports were for military purposes in liberated areas and for lend-lease. In the October-December quarter UNRRA began taking United States wheat in large volume, and it presented large requests for the first half of 1946. Meantime, the demand increased from paying countries, in some cases to a level considerably above their normal or prewar wheat imports. Total requests far exceeded supplies, and obliged this and other wheat exporting countries to ask for reexamination and if possible reduction of requirements. There was no prospect of meeting all 1945–46 requests.

Maximum export availability of wheat (including wheat in the form of flour) from the United States, Canada, Argentina, and Australia for the year July 1945 to June 1946 was estimated at 925 million bushels. By countries, the indicated availability was: United States 400 million bushels; Canada, 365 million; Argentina, 110 million;

and Australia, 50 million. Export movement of such a quantity would represent a record in the history of international trade. Stated requirements, however, ran considerably higher—specifically, up to about 1,120 million bushels. Shortage of transport, and of port facilities, along with the deficit between supplies and requests, made it certain that the demand could not be filled. Besides those of UNRRA, requirements of an unusual nature included those of France, French North Africa, China, India, and some other countries. As one means of bridging the gap between wheat supplies and requirements, food authorities recommended maximum utilization of other grains for breadstuffs.

In 1945 there were two world prices for wheat: (1) the Canadian price, to which Australia and Argentina adhered; (2) the American price, which averaged 35 to 40 cents a bushel higher. The Canadian Government, by order in Council, requested its Wheat Board not to sell at prices exceeding those in effect at the end of the war. Strong commercial export demand absorbed all available United States wheat at the higher level, and yet was by no means fully met.

Federal legislation provides price-support loans to wheat farmers. Under the Agricultural Adjustment Act of 1938, as amended by the Stabilization Act of October 2, 1942, loans are available to cooperating farmers at 90 percent of parity on wheat harvested before the expiration of the 2-year period beginning the first of January following the official proclamation that hostilities have ceased. There is a limiting condition. Such loans are available "* * * if producers have not disapproved marketing quotas * * *" (Public 729, 77th Cong. ch. 578, 2d sess. H. R. 7565, sec. 8).

Acreage goals suggested by State committees for the 1946 crop add up to 68.9 million acres—practically the acreage seeded for the 1945 crop. Average yields on 68.9 million acres would produce a crop of about 900 million bushels. (Production in 1945 was about 1,150 million bushels, but the yields were above average.) With a crop of 900 million bushels, plus the carry-over stocks, this country would have approximately from 300 to 350 million bushels of wheat for export in 1946–47 and carryover on July 1, 1947.

Our wheat supply for the 1945–46 marketing year is about 1,450 million bushels; it has been exceeded only by the supplies of 1942 and 1943. We shall not do very much wheat importing in 1945–46—possibly the imports will not exceed 10 million bushels. How much wheat we shall have left for carry-over on July 1 next depends more on the disappearance for exports and for animal feed than on that for food, seed, and the production of alcohol. These items, the largest of which are 530 million bushels for civilian and military food and about 350 million bushels for export as wheat and flour, add up to an estimated 1,150 million bushels. Carry-over July 1 next is expected to be below the 1932–41 average of 235 million bushels if the export movement fulfills present indications.

Meantime, many factors are giving strong support to wheat prices. Urgent needs for wheat and flour in liberated areas are holding purchases for export at high levels. Moreover, in August 1945 the Government announced a program that offered farmers the full parity

price for 1945-crop loan wheat. This means that farmers who placed 1945-crop wheat under loan will have the option of selling it in the spring of 1946 to the Production and Marketing Administration at 15 cents above the loan value less charges. In December 1945 wheat was at about parity in the United States.

Fitting Wheat into Postwar World

Major problems have to be solved in order to fit wheat into the postwar world. In the war years the demand for wheat as food, as feed for livestock, and as raw material for industrial alcohol has been high. Now that the fighting is all over, the demand may ultimately fall off, and we may have more wheat than can be moved at prices satisfactory to growers. Price support will continue into the postwar years. But whether other measures will eventually be necessary, such as acreage limitation, extensive subsidization of exports, some two-price plan, or some shift from supported to competitive prices accompanied by income or conversion payments, is matter for discussion. As a means of facilitating the discussion, the Department has reviewed the history of our wheat farming and presented the courses that lie open. Naturally the alternatives have advantages and draw-backs. Hence, the Department has tried to see what these would be.

Necessarily, the analysis begins with background materials. Our wheat problem involves acreage, yield trends, regional peculiarities, farm technology, consumer demands, world outlets, and price conditions. Attempts to settle it offhand, with a merely superficial survey, would run the risk of failure. True, the most exhaustive investigation would not point surely to the correct answer, because it would not show what level of employment we shall have. More depends on that than on anything else. Nevertheless, a comprehensive collection of background facts improves the chance of deciding wisely as to policy. Accordingly, the Department has gathered and published the pertinent data, together with comments on the alternative possibilities. In this report, only the high points can be noted. These, however, will indicate the elements of the wheat problem, and serve as a basis for discussion of means proposed for handling it.

Wheat is our second most important cereal crop; normally it occupies about one-sixth of our cropland; it is grown in nearly every State; in large subhumid areas it is almost the only source of cash-crop income; mechanization has advanced further with wheat than with any other major crop; normally we produce more than we need for domestic food uses, with the result that Government action has been necessary to dispose of surpluses.

When we have export surpluses and world prices are low, the price is low also in the United States unless the Government intervenes. For example, the average price received per bushel of wheat by the United States farmers for the 1931 crop was 39 cents; the average price dropped to 38 cents for the 1932 crop. Parity price for the 1932 wheat crop was 91 cents a bushel. Since 1933 the Government has supported wheat prices at considerably above the world-price level, and is now supporting them at parity, or about $1.50 a bushel.

Long-Time Acreage

Total wheat acreage in the United States has shown no significant long-time change within the last 35 years, though significant regional changes have taken place within this period. Over shorter periods the total acreage has fluctuated markedly. For example, the high prices of World War I stimulated acreage expansion, which in 1919 reached 74 million harvested acres. Phenomenal increases occurred in the hard winter and soft red winter wheat areas. After World War I the acreage declined, mainly in the more humid regions and in 1924, it was down to 55.7 million seeded acres. In 1925, however, the national seeded acreage started upward again. In 1937 it reached an all-time high of 81 million acres, but dropped to 62.5 million acres in 1939, and the down trend continued until 1943.

Apparent in all major wheat regions, the acreage curtailment was greatest in the soft red winter wheat region. Total seeded acreage in the United States in 1943 was 52 million, the lowest recorded since this estimate was first made. In 1944 the removal of acreage restrictions, along with price increases, raised the total sharply to 65.7 million acres, and in 1945 plantings exceeded 68.8 million acres. Wheat acreage responds to price changes promptly in the humid areas, which have alternative crops; less promptly in the specialized wheat areas, where the alternative is usually the slow, difficult, and costly shift to a grass economy.

Yields of wheat on a national average basis show no clearly defined long-time trend. Between 1919 and 1939 a considerable shift took place in areas of wheat production and more of the acreage came to be in the drier, lower yielding regions. In the drought years of the 1930's, yields were of course low; more recently, the trend has been upward. In some areas, for example, the soft red winter and the Pacific Northwest regions, a definite upward trend begins to be apparent, partly attributable to improved varieties and better farming methods. Continued improvement is probable.

Mechanization of Wheat Farming

Mechanization, more advanced in wheat farming than in any other major branch of agriculture, has been rapid since World War I. Horse-drawn equipment has almost disappeared, and wheat farms have increased greatly in average size. Wheat farms generally will probably continue to get larger, because machinery enables the operators to handle acreage far above the present average. Between 1910 and 1940 the average size of spring wheat farms in selected counties increased from 371 to 500 acres; in the hard winter wheat area the increase was from 453 to 529 acres. Wheat farms in the western part of the Pacific Northwest region increased in size from 682 to 1,134 acres.

Tractors and combine harvesters have been chiefly responsible; these machines reduce the labor requirement greatly. Mechanized wheat farms today produce more wheat per farm, represent a greater investment in land and buildings, and produce much more income than before World War I. Labor requirements in the hard winter wheat

area per acre since 1910–14 dropped from 6 hours to 2.2 hours; the average investment in land and buildings has increased from $8,877 to $13,097; and production of wheat per farm has doubled. Farms that have not kept pace with the trend in mechanization and in average size seldom return adequate incomes to the operators.

Necessarily, because of annual variations in yields and in harvested acreage, our total wheat production fluctuates. From 1910 through 1944 it averaged about 600 million bushels. In 1944 and also in 1945, however, the production exceeded 1 billion bushels; whereas in 1934 it amounted to only 526 million bushels. Annual variations of more than 100 million bushels are not uncommon, with the long-time trend slightly upward. For example, the annual average in the period 1938–44 was 900 million bushels as compared with about 725 million in the period 1910–14. Production in the World War II years considerably exceeded that of World War I.

Yet in the early years of World War II the Government did not specially encourage wheat production. During World War I wheat expansion was a major item in the war-food program. Moreover, the greatest production in the World War II period came from a smaller acreage. In the 3-year period 1942–44 it averaged 965 million bushels from an average harvested area of only 53 million acres. Production averaged only 824 million bushels from an average harvested area of 59 million acres in World War I years. True the weather was very favorable in the World War II years.

The Meaning of the Wheat Facts

What do these facts imply? Current production, which is well above normal domestic food requirements, presupposes feed and other uses plus some export trade. In the 16 years up to 1928 our net exports fluctuated annually around the 200 million mark, and carry-over stocks seldom exceeded 140 million bushels. Thereafter, however, the wheat exports declined. In 1934, a drought year, they fell below wheat imports. We had net imports of wheat also in 1935 and 1936. Subsequently, however, the carry-over stocks rose and in 1942 and 1943 reached an all-time high of more than 600 million bushels. Since 1933 the Government has been supporting domestic wheat at prices far above the world-price level, and under such conditions exports are seldom possible except on a subsidized basis.

As in the past, the major outlet for the United States will continue to be using it domestically for food. Per capita consumption, which had been declining for several decades, increased in the war years but we cannot expect this increase to continue. Probably, however, the domestic per capita food consumption of wheat will not drop below the prewar level. Thus, with allowance for population growth, the United States demand for wheat for human food may range from 540 to 570 million bushels.

Other uses include seed, the feeding of domestic livestock, and exports. Adding these brings the total prospective utilization by 1955 within a range of 785 to 925 million bushels. This calculation allows for exports at from 60 to 80 million bushels, in line with the International Wheat Agreement. Utilization near the top of the range, with

production not below the 1938–44 average (900 million bushels), will leave no surplus. But utilization near the bottom of the range, with production at the 1938–44 average level, will leave a substantial surplus.

On a seeded acreage equal to the 1919–44 average of 66 million, total production with expected yields under normal weather conditions would be about 950 million bushels, or about 3 percent above the probable estimated maximum utilization. Only about 54 million acres would suffice for the estimated minimum utilization. The all-time high, reached in 1937 at 81 million acres, would not easily be reached again but it could be. On 81 million acres, with normal weather, production would run above 1 billion bushels.

On a seeded wheat area of about 63 million acres—the area suggested by State committees as a long-time objective—production with average yields would be slightly below the estimated maximum demand but substantially above the estimated minimum. Should the minimum rather than the maximum demand prevail, the seeded acreage might decline in the soft red winter wheat region, but would tend to be maintained in the other major wheat regions, which have no alternative lines of production. Total seeded acreage would probably not decline below 60 million acres; except under an acreage-control program or in a prolonged depression. With only minimum (785 million bushels) utilization, we would have an annual surplus of 80 million bushels.

Possible Alternatives in Policy

As a broad objective, the idea of parity returns for wheat farmers has been accepted. Various approaches to this general goal are possible, but they do not all point to exactly the same place.

One method of giving parity returns to farmers calls for price support at parity levels. Without acreage restrictions, this would result in surpluses. Modern methods, applied on our enlarged farms, would facilitate the planting of an acreage much above the need. Yields below the recent average, on an acreage thus expanded, would give a production above the estimated maximum requirements and far above the estimated minimum. Hence, price support at parity, without controls on quantity, would raise some knotty problems.

Another possible policy would offer parity prices with production control, and perhaps also with marketing quotas. How severe would the controls need to be? Prices do not much lessen the quantity of wheat used for food in the United States; even a big rise in the price of the grain means only a small rise in the price of bread. But with wheat at or near parity, comparatively little would be fed to livestock; moreover, exports would be possible only under subsidy. Hence the amount of acreage and marketing limitation necessary would depend on the amount of subsidized exporting that could be done. Probably total utilization of United States wheat at parity prices would not exceed 785 million bushels; without an export subsidy, the quantity might drop to 700 million bushels, or no more than could be obtained from 52 million acres or less.

Still another possible policy would maintain wheat at parity or near-parity for food uses in the United States but would put wheat

for feed and for export on a free market basis. This would be a two-price system. It would have a double purpose—to maximize returns to growers and promote full utilization of wheat resources. Farmers would get a blended price; wheat would be less than parity. How much less would depend partly on the ratio between the domestic food use and the nonfood uses of the crop, and partly on the world-price level. Crop control would not be necessary. Farmers would realize, however, that the United States food-use demand was more profitable to them than the rest of the demand, and would have a motive not to oversupply the latter.

One way of applying the two-price principle would require millers to purchase certificates for each barrel of flour sold or on their purchases of cash wheat for milling. These certificates would bring the cost of the wheat to the millers up to a level that would make it possible for farmers to receive parity for all the wheat they sold for domestic food uses. Another way would require flour millers to purchase their wheat at parity prices from the Government. Farmers would receive a blended price in any event. It would make an important difference, however, if the farmers knew or did not know how the domestic food and the other uses contributed proportionately to the blend. If they knew, they would see clearly when it would and when it would not pay them to grow wheat for feed or export uses. If they did not know, they would be in the dark as to that.

Requirements for Adjustment to World Market

Still another possibility is to adopt a policy that would eventually eliminate price-supports and production controls, and let wheat prices be determined in a free market. Transition to a free market basis, however, would have to be done gradually over a period of years, because the land-value structure and the costs of wheat farming in the United States have been built up on a price structure above world levels. A sudden shift to world prices would cause hardship on many farms and would ruin some of the less efficient producers. Under definitely favorable world conditions, free from chronic wheat-surplus situations, competitive pricing along with programs to sustain wheat incomes in depression years and to improve the pattern of wheat farming might ultimately strengthen our wheat industry.

But we must be clear as to what these necessary favorable conditions would be. More mechanization and increases in the size of the smaller farms would mean fewer wheat farmers; hence, other work would have to be available for some wheat growers, either on or off the farms. Full employment, with some development of local industries in wheat States, would tend to solve this problem. Large scale unemployment would leave it troublesome. Another requirement would be a world trade situation not unfavorable to wheat exports from the United States—in other words, the adoption by other countries of policies favorable to unrestricted commerce. The problem is not one that this country can solve all by itself. Besides active employment in the United States, the return of wheat to a free market basis would necessitate liberalized trade conditions practically throughout the world.

The return to free market pricing, if deemed advisable, would need the help of conversion payments, special types of credit, extension of the crop-insurance system, shifts of some of the poorer wheatland to grass, the combination of wheat growing with livestock raising in some areas, measures to enlarge the smaller wheat farms, adequate conservation programs, and other means of coping with world competition. Granted the helpful conditions mentioned, such a program might be workable.

The major alternative policies briefly described above refer to long-range possibilities. Action for the immediate future has been prescribed by Congress in price-support legislation and in the Surplus Property Disposal Act of 1944, which authorizes the Commodity Credit Corporation to arrange for the disposal of surpluses in world markets at world prices. Selection of a long-range policy is difficult at present, because the chances of success or failure depend on many developments that cannot be foreseen, particularly in connection with international trade.

FEED-GRAINS PROBLEM

The feed-grain situation during 1945 was one of scarcity amid plenty. In other words, the supply of feed grains and other feeds was large as compared with prewar years; but the demand for these products was large also. At the prevailing high prices, it exceeded the market supply, particularly of corn, throughout most of the year. Marketings of feed grains were larger than usual, but purchasers would have taken still larger quantities had the supply in the commercial channels been greater.

The disappearance of feed grain, though heavy during the 1944–45 season, was not quite as heavy as in either of the two previous seasons. This was the result principally of reductions during the season in the number of hogs and chickens. But the rate of feeding per unit of livestock produced was higher than in the previous year and it produced record yields of livestock and poultry products. For example, the hogs slaughtered under Federal inspection during 1945 averaged about 260 pounds, the heaviest on record. Milk production per cow was at a record level and likewise egg production per layer on farms.

Meantime the utilization of feed grains for food and industrial uses was greater than in the preceding war years and greater than that in most earlier years. The total use of corn, oats, barley, and sorghum grains for seed, human food, industry, and exports amounted to nearly 15 million tons in the 1945 season—2 million tons more than in 1943–44. But despite the heavy feeding and the increased use of feed grains for food and industrial purposes the stocks of old-crop grain on farms at the end of the 1944–45 crop year increased. With large production again this year, the domestic supply of feed grains for 1945–46 (not including wheat and rye for feed) will be larger than it was in 1944–45.

Postwar handling of feed grains poses problems sharply different from those presented by the great export crops. Agriculture produces feed grains, principally corn, feed-wheat, barley, oats, and grain

sorghums, for its own use, either on the farms that grow these crops, or on farms and ranches whose operators purchase feed supplies. In other words, the market is domestic. Largely, this is also true of the beef cattle, dairy cattle, sheep and poultry that consume the grains, and to a considerable extent it is also true of hogs. Hence in this connection, the difference between domestic and world prices is not vitally important; it does not suggest the use either of any two-price system, or of any program to make American feed-grain prices fully competitive in world markets.

Another reason exists for shaping feed-grain policy differently from that of other basic crops. As previously shown, long-time conversion in the cotton and wheat areas seems to call for some shift out of cotton and wheat. Alternative enterprises would be largely feeds and livestock. Obviously, enhanced regional competition might result; this would not be serious in times of active business and high consumer incomes, but would be bothersome in a depression. Conversion cannot leave the feed and livestock industries where they may have to hold the bag unaided; it must develop protective features, such as will come into operation promptly and even automatically whenever supply conditions get out of hand. It is too early to specify details; but I think we shall want a program to maintain high domestic consumption of livestock products, along with loan and storage facilities designed to stabilize supplies on the principle of the Ever Normal Granary.

Ample stocks would tend to stabilize livestock production, and consequently to lessen fluctuations in livestock prices. Kept more nearly on an even keel, the livestock industries would be more continuously profitable. Simultaneously, consumers would have steadier and better distribution of livestock products. Storage against lean years would also serve to stabilize feed-grain prices, even apart from any definite price support commitment.

DAIRYING

During the war the manufacture or distribution of every major dairy product was subject to controls designed to limit civilian consumption and make adequate supplies available for military and associated war uses. These limitations were necessary despite substantial increases in milk production. The increased production must be absorbed in civilian outlets as the wartime requirements are reduced. History has demonstrated that rapid contraction of milk production is not feasible. Moreover, from a nutritional standpoint maintenance of milk production is desirable.

With the advent of VJ-day near the end of the flush production season, the shift of milk from wartime utilization to domestic civilian use is being undertaken promptly. Military and other Government agencies procuring dairy products, maintained a policy of securing most of their annual requirements during the period of flush production. By acquiring sufficient stocks during spring and summer to tide war agencies over the winter, alternate periods of feast and famine in civilian distribution were avoided. Thus, stocks of dairy products

held by or set aside for military agencies when war ended were sufficient and in some instances more than sufficient to feed the reduced personnel expected in the armed forces.

As quickly as war agencies were able to determine that military and overseas demands could be met from available stocks, steps were taken to eliminate War Food Orders applicable to dairy products. Limitation orders designed to divert milk into production of war-needed products were terminated when set-aside provisions on particular products were discontinued. For example, when the United States Army Quartermaster Corps notified the Department of Agriculture that it had enough butter to last until spring of 1946, termination of War Food Order No. 2, which required creameries to set aside butter for sale to governmental agencies, was announced on September 1, 1945. Coincident with this action limitations on utilization of butterfat in production of whipping cream and ice cream were removed. Eight orders were suspended or terminated within a month after the war ended. Relaxation of ration point requirements for dairy products kept pace with the increased supplies.

So long as war continued, demand for dairy products was sufficiently large to absorb all milk produced. Products manufactured from milk were marketed readily at ceiling prices. Milk production increased under these circumstances from an average annual production of 107.9 billion pounds during the prewar period, 1937–41, to an estimated 123 billion pounds for 1945.

Under war conditions a primary objective was to maximize production of dairy products by encouraging greater milk production and more complete utilization of skim milk for direct human consumption. Substantially higher returns paid to farmers for milk contributed to this change. Cash receipts from farm marketings of dairy products increased from an annual average of 1.4 billion dollars in the period 1935–39, to nearly 3 billion dollars in 1944. This income was supplemented by dairy-production payments made directly to producers on milk and butterfat sales. These payments amounted to 384 million dollars in the calendar year 1944 and about 450 million dollars for the fiscal year ended June 30, 1945.

Questions now confronting the dairy industry involve the ability and willingness of civilians to consume the increased quantity of milk and also the attitude of farmers toward continuing production of this milk under the altered circumstances necessarily resulting from the cessation of war.

Farm Dairy Capacity

Farmers have potential capacity to produce as much as or more milk in postwar years. The number of cows on farms has gained steadily since 1938, reaching the highest point on record last fall. In 1944 cows on farms averaged almost 26 million head, compared with a prewar average of 23.5 million. Milk production per cow was above average in 1944 but it was distinctly below the rates reached in 1941 and 1942. Thus, it is evident farmers could with favorable labor and feed conditions produce substantially more milk than the 119 billion pounds actually produced in 1944. Shortages of labor, which were

primarily responsible for difficulties in production per cow in recent years, are apt to be eased as men are released from the armed services and war industries. Feed supplies have been well above prewar levels and pastures have been excellent. Favorable weather conditions hold promise for maintenance of the expanded milk production accomplished during the war.

Recommendations from nutritional authorities indicate that all available milk and dairy products could and should be utilized in the American diet. Indeed, considerable further expansion in milk production would be necesary to meet the dietary standards that have been advocated. With larger national income and increased buying power, conditions are more favorable than they were before the war for achieving a high rate of consumption at prices which will return a reasonable profit to dairy farmers.

Even if civilian demand proves to be sufficiently great to absorb all milk produced, the dairy industry will be confronted with processing and marketing problems involved in shifting milk to production of different products than those manufactured for war. Principal emphasis has been placed upon concentrated milk products that could be shipped and stored easily under war conditions. Substantially more production of Cheddar cheese, evaporated and dried milks, and dry ice cream mix resulted. The domestic market on which the dairy industry will have to rely after postwar adjustments have been made is not likely to be able to absorb large increased quantities of these products if they become suddenly available.

Perhaps the most significant change was the shift from marketing farm-separated cream to marketing whole milk. Wholesale deliveries of whole milk by farmers increased from an annual average of 42 million pounds in the 5 years immediately preceding the war to an estimated 64 million pounds in 1944 and an estimated 69 million pounds in 1945. A decline from 32 to 27 million pounds in the milk equivalent of cream sales occurred in the same periods. By far the greatest share of additional skim milk made available by this change was processed into nonfat dry-milk solids. Production for human consumption rose from 322 million pounds in 1940 to 584 million pounds in 1944, and an estimated 645 million total in 1945. Even greater quantities of skim milk will be available with increased production of whipping cream and butter. Some of it may be utilized in the preparation of casein and animal feed, which were reduced during the war, but efficient utilization of this skim milk will be an important postwar dairy marketing adjustment. New uses for fluid skim milk and powder will be sought to replace the overseas markets developed during the war.

Postwar dairy marketing will also entail a shift in emphasis from quantity to quality of production. Substitutes, especially for butter, whipping cream, and animal feed products, gained considerable headway while dairy products were restricted. Reliance will be placed upon quality to regain consumer preference attained for these products in prewar years. Local, State, and Federal Government agencies will have time to devote to assisting industry in this endeavor.

MEAT ANIMALS AND MEATS

In meats the situation became extremely tight in 1945. Civilian consumption declined from the high level of 150 pounds per capita (wholesale weight) in 1944 to 125–130 pounds, approximately the same as the 1935–39 average of 126 pounds per capita. Consumer purchasing power in 1945 was much greater than before the war. At prevailing prices, the supply of meat for civilians was only about three-fourths as great as the potential demand. The shortage was accentuated by shortages of other foods, particularly poultry. Basically, the civilian meat shortage in 1945 was the result of reduced production of pork, increased military needs, and increased consumer purchasing power.

Total meat production was nearly 2 billion pounds smaller than the record production of 24.6 billion pounds in 1944; yet it was over 6 billion pounds more than the average annual production of 16.2 billion pounds in the period 1935–39. Production of beef was moderately greater than in 1944; production of veal and of lamb was slightly less; pork production was 20 percent less.

Output of pork, which increased from slightly over 7 billion pounds in 1935–39 to around 13 billion pounds in 1944, dropped sharply in 1945 to about 10 billion pounds. This reduction followed a reduction in the number of sows farrowed in 1944. After increasing from the low level of 63 million head in 1937 to a record of almost 122 million head in 1943, the annual pig crop declined to 87 million head in 1944. Reserve supplies of feed grains had been largely used up by the spring of 1944. Livestock production had consequently to be adjusted downward to a current feed production basis. Most of the reduction occurred in hogs and poultry; milk-cow and beef-cattle numbers remained at a high level.

Large requirements for direct war uses were the second major factor in the decrease of civilian supplies of meat in 1945. Military purchases combined with purchases by the Department of Agriculture rose from approximately 5½ billion pounds (wholesale dressed meat basis) in 1944 to around 6 billion pounds in 1945. All the increase was in the military procurement. Purchases by the Department of Agriculture, for lend-lease and other shipments abroad were somewhat less than in 1944.

Civilian Distribution Improved

Action taken by the Government improved the civilian distribution of meat in 1945. It included reduced Government procurement during the summer months, when production was seasonally low; the establishment of differential set-asides for Government procurement on the basis of the relative volume of slaughtering by individual slaughterers; and the certification of nonfederally inspected slaughtering plants that met basic sanitary standards. This certification permitted such plants to sell meat to the Government and to ship meat across State lines.

Also, the Department of Agriculture began incentive programs to encourage increased cattle feeding. Payments to farmers on slaughter

cattle began in May 1945; the purpose was to bring about increased grain feeding of cattle and the marketing of cattle at heavier weights. Similar payments on sheep and lambs marketed for slaughter began in August 1945.

Cattle numbers at the beginning of 1945 totalled almost 82 million head and were only slightly lower than the record number on hand at the beginning of 1944. They assured a record or near record production of beef and veal. Pasture and range conditions were good, and the hay supply was ample for carrying cattle through the winter. Slaughter of cattle and calves promised to continue large for the next 3 or 4 years at least, because the number of cattle on farms and ranches was apparently close to a peak in the numbers cycle.

On the other hand, sheep numbers have been sharply reduced during the past 3 years, primarily as the result of a severe shortage of experienced sheepherders.

Rapid reduction in sheep numbers in the critical war years resulted in a large production of lamb and mutton. If sheep numbers are stabilized near present levels during the next year or two, the production of lamb and mutton will be materially smaller than in the past 3 years. However, lamb and mutton normally constitute only 4 or 5 percent of our total meat production.

Supply Prospects for 1946

With the current outlook for approximately the same total supply of feed concentrates in the present feeding season as in the last season, no material expansion in the pig crops is likely in 1946. Comparative abundance of feed grains in the first 9 months of 1945 and the relatively high prices that prevailed for hogs resulted in a fall pig crop in 1945 larger than that of a year earlier. Consequently, more hogs will probably be marketed in the late spring and summer of 1946 than were marketed in the spring and summer of 1945, when our meat situation was most critical.

It is too early to make an accurate forecast of total meat production in 1946. Present prospects, however, indicate that no material change will occur in the total output as compared with that of 1945. Reduced requirements for meat by the armed forces will improve the civilian supply situation. If meat production is about as large as it was in 1945, more should be available for civilians.

FRUITS AND VEGETABLES

Fruits and vegetables in 1945 constituted slightly more than one-third of the aggregate weight of all the foods produced and were the source of about 15 percent of the total cash income from farm marketings. Despite much unfavorable weather, continuing scarcity of labor, and other problems, farmers produced a total quantity only slightly smaller than that in 1944. Prices for most fruits and vegetables in 1945 averaged near the high wartime levels of 1944. Farm income from these products was about as high as in that year.

The 1944–45 crop of citrus fruit, most of which was harvested in 1945, was a record, despite severe hurricane damage in Florida. The

1945–46 crop will also be large. It may not exceed the previous crop, because dry weather prevailed in Florida during the first half of the year. Among the important deciduous fruits, the crops of peaches, grapes, pears, and prunes were larger than in 1944, while the cherry, apricot, and apple crops were smaller. Spring freezes in the North Central, Northeastern, and Middle Atlantic States adversely affected production of fruits in general. However, production of peaches and pears for the entire United States set new high records. In addition to peaches and pears, large crops of apples, sweet cherries, grapes and other fruits were produced in the Pacific Coast States.

Production of commercial truck crops for fresh use and for processing was about equal to the large output of 1944. The potato crop, because of extremely favorable growing conditions, was considerably larger than in 1944; much of the increase occurred in high-yielding surplus late States. This year's crops of sweetpotatoes and dry edible beans, about average in size, were only slightly smaller than last year. Production of dry field peas, however, was approximately one-third smaller than last year, because of considerable reductions in acreage and yield.

Price-support programs were similar to those in effect for the 1944 crops. Support levels generally were at or near those of 1944. Prices for many of the supported crops held at or near ceiling levels in response to a strong civilian demand and high noncivilian requirements. Except for late-crop potatoes, only limited action under the price-support programs was necessary. Substantial quantities of late-crop potatoes were purchased by the Government in order to hold prices up to support levels. These potatoes were utilized in the manufacture of starch and canned potatoes, in school-lunch programs, and in other ways. With prices at support levels and the second largest crop on record in prospect, ceiling prices were suspended in September.

Commercial packs of processed fruits and vegetables were about as large as those of 1944. Civilian supplies for the 1945–46 season are materially larger than last season, because of the great reduction in military requirements made possible by the sudden ending of the war with Japan. All canned fruits and vegetables, including juices, were released from rationing in August. Civilians were encouraged early in the year to grow home gardens and to preserve needed quantities of fruits and vegetables. Supplies of fresh fruits and vegetables were generally adequate, though transportation difficulties hampered distribution.

Military and other noncivilian requirements will not be as large next year; civilian demand, too, may not be quite so strong; yet, large supplies of fruits and vegetables will be needed in 1946. With favorable growing and harvesting conditions, big crops of fruits can be expected next year from present orchards and vineyards. Farmers can produce the required quantities of vegetables by adjusting their acreage to prospective needs.

Specialization by Areas

With the removal of wartime restrictions and the return to peacetime conditions, marked and rapid developments in the growing,

processing, transportation, and selling of fruits and vegetables are to be expected. Progressive farm adjustments will be in order. Further specialization by areas is probable. Increased exports of fruits, especially of apples and pears, can be expected; but also increased imports, particularly of bananas and cacao beans. Competition will be keener among various products and among various producing areas.

Advances in processing, transportation, and storage should make fruits and vegetables available in higher quality and better condition throughout the year. The use of frozen fruits and vegetables are likely to become more general, though the canned and dried products will continue to provide the largest volume of processed items. Consumer demand should be better satisfied than during wartime. This will call for more of some fruits and vegetables and less of others. In the aggregate the volume in the early postwar years probably will be about what it is now.

Price behavior is likely to be similar to that of prewar years. Prices for fruits and vegetables can be expected to rise and fall with the price level for other farm commodities, which will tend to vary with general demand and business conditions. Prices for individual fruits and vegetables will tend to vary inversely with the size of the crop, as well as directly with general demand conditions.

FATS AND OILS

The supplies of fats and oils available for United States civilians in 1945 have been the smallest for many years. Several factors have contributed to this reduced supply, such as a decreased quantity of lard, a smaller supply of flaxseed, decreased imports, and substantial exports to Allied and liberated countries. During most of the year, rationing of edible fats and oils for civilians and industrial quotas to manufacturers was at the lowest level of the war.

World War II has forcibly brought attention to the dependence of the United States on foreign countries for imports and exports of fats, oils, and oilseeds. Prior to the war, imports ranged from 1½ to 2½ billion pounds of fats and oils annually and represented 15 to 25 percent of total consumption. With the Japanese occupation of the Pacific islands, which were the principal sources of our imports, and the increased domestic demand created by the war industries, the United States supply situation became critical. Since the United Kingdom and the Soviet Union were also faced with desperate shortages of fats and oils, it became necessary for the United States to share its inadequate supplies with them.

To meet the acute situation, the United States Government early in the war undertook several measures to stimulate greater production, such as paying a premium for heavy hogs and guaranteeing prices for vegetable oilseed crops. With the splendid cooperation of farmers and favorable weather, notable results were achieved during the past 4 years. Production of oils and fats in 1943 and in 1944 reached an all-time high of nearly 11 billion pounds, about 3 billion pounds, or 35 percent, above that of 1939. Production of vegetable oils from domestically grown soybeans, flaxseed, cottonseed, and peanuts during

the past 3 years has been 75 percent greater than in 1939. Total production in 1945 declined to below 10 billion pounds owing mainly to the sharp decrease in animal fat production and smaller production of soybeans.

The maintenance of the high level of vegetable oil production in the United States is a problem that warrants timely attention. The liberation of Europe has created an unusual demand for fats and oils. Continental Europe, excluding Russia, has been the world's largest fats and oils consuming and importing area. Prewar consumption of both edible and inedible fats and oils amounted to about 14 billion pounds annually, of which 4 billion were imported. In the war years European production of animal fats, which formerly accounted for about two-thirds of the total, was materially reduced, owing to a shortage of livestock feed. Several liberated countries which were required to expand vegetable oilseed production under German control will continue to emphasize oilseed crops. Import requirements, however, will remain large. If world prices do not advance above present levels, available world supplies are likely to be inadequate to fulfill requirements in 1946. Even though hostilities have ended in the Pacific, new supplies available for Europe and the Western Hemisphere have thus far proved disappointingly small. Only moderate supplies will be available by the middle of 1946, and a longer period will be required before copra, palm oil, and soybeans will again be available in the prewar volume.

Change Expected from Prewar Demand

The postwar demand for fats and oils is expected to follow a somewhat different pattern than before the war. In the United States and Canada the postwar industrial activities should create a strong demand for both edible and industrial fats and oils. The demand in Latin American countries is expected to be at a higher level, at least for a few years, on account of their increased buying power. The European demand may not equal the prewar level. The United Kingdom, the Soviet Union, and Sweden will undoubtedly have high industrial activity and a strong demand for fats and oils. On the other hand, recovery may be slow in war-torn areas of Central Europe and the effective demand there for these commodities in terms of purchasing power may continue below that of the prewar period for many years.

While the immediate outlook, both for the United States and the world, indicates a shortage of fats and oils to meet all consumer and export requirements, it is reasonable to assume that surplus supplies will be likely within a few years. The renewal of whaling in the Antarctic and restored production of oils and oilseeds in the Far East may make total world supplies so large that prices cannot be maintained at present levels.

POULTRY AND EGG PRODUCTS

In the past year the poultry and egg industry has experienced extremes of possible production and marketing conditions. In the

summer of 1944 it was just overcoming a surplus condition. The Government was then purchasing large quantities of dried eggs not only for lend-lease purposes, but also as a means of supporting egg prices. It was purchasing shell eggs as an additional means of supporting prices. By October 1944, however, the surplus had substantially disappeared. Egg prices became firm in late November of 1944. Since then they have been practically at ceiling levels continuously, though a temporary decline occurred in September and early October of 1945.

Egg shortages were somewhat acute during most of 1945; they resulted largely from shortages that prevailed simultaneously in the supply of meats for civilians. In April, May, and June egg prices rose substantially above the ceilings in many areas. Civilian consumption of eggs for 1945 may run close to 400 per capita, as compared with 351 in 1944. Considerable substitution of eggs for meat occurred in all areas with the result that even in the midwestern surplus production area the supplies of eggs were far from being ample. In fact, war agencies were unable to procure their full requirements during the months of peak production. Nevertheless, through an extended use of priorities, the procurement program for shell eggs was about on schedule at the end of the fiscal year. However, the procurement of dried and frozen eggs was behind schedule.

The apparent scarcity of eggs during the first half of 1945 occasioned much discussion. By any historical standard, however, eggs in this period were not scarce. An extremely high civilian demand ran above the relatively abundant production, which during 1945 was about 40 percent above the average for 1937–41. Producers accomplished this showing against handicaps such as shortages of labor, feed, and equipment. From January through October 1945 egg production was only about 5 percent below the all-time high for the same period in 1944 when prices to producers were much lower.

Plans are now being perfected to support prices during the coming season of peak egg production. This program is proposed to support egg prices as provided by law at not less than 90 percent of parity.

In the early months of fiscal 1945 procurement of chickens by war agencies was far below the minimum requirements as the result primarily of the prevailing strong storage demand for civilian purposes. Compared with that of the previous year, the supply of friers and roasters was relatively low; the number of chickens raised in the spring of 1944 had been some 20 percent lower than the number raised in the spring of 1943. Among the causes of the reduction were lower egg prices, critically short feed supplies in many areas, and the belief that the war in Europe would soon be over.

Accordingly, the War Food Administration issued Food Order WFO 119 on December 11, 1944. This order set aside for military procurement 100 percent of the poultry produced in major commercial broiler areas. A difficult procurement problem arose in connection with canned, boned chicken. In the fall of 1944 the Army announced it required 70 million pounds of canned, boned chicken—the processed equivalent of between 200 and 250 million pounds of dressed chicken. Offers to purchase this quantity in the open market brought an insuf-

ficient response partly because poultry supplies were inadequate and partly because canners wished to continue production of certain canned poultry for their civilian trade. Therefore, at the request of war agencies, the War Food Administration issued its order WFO 125 which provided that no poultry could be canned except for Army purchase and according to Army specifications.

In the spring of 1945, however, the production of baby chicks increased substantially over 1944. By the end of June chick production was 15 percent above the production in the first half of 1944; by the end of October it was 25 percent above the level for the corresponding period in the previous year. Production of commercial broilers reached an all-time peak under the stimulus of a virtual guarantee of ceiling prices in the major set-aside areas. Broiler production expanded also in other areas. Nevertheless, the shortage of poultry meat lasted until after V–J Day. But for the full year of 1945 poultry meat production will be about 3.6 billion pounds. The civilian supply for the year will be an estimated 24.5 pounds per capita as compared to an actual consumption in 1944 at 23.6 pounds. Producers found turkey production attractive and the turkey crop for the year promised to be as much as 20 percent above that of 1944.

SUGAR

In meeting sugar requirements, 1945 was the most difficult of the war years. Consumption under our sugar-rationing program in 1944 was about 800,000 tons above the allocation for civilians. Thus, the Nation entered the year 1945 with seriously depleted stocks. A Cuban drought which began in the fall of 1944 and continued until May 1945 resulted in a Cuban crop of about 3,924,000 tons, which was about 750,000 tons below expectations. The drop was especially severe when compared with an abnormal 1944 crop. The large 1944 crop was due, to a great extent, to cuttings of 2-year-old cane which could not be harvested, processed, and shipped as new sugar because of United States transportation difficulties and German submarine warfare at the time. The very large 1944 crop, totaling 5,646,000 tons, furnished the equivalent of 900,000 tons of sugar in the form of high-test molasses which had to be used chiefly in the production of alcohol required in the manufacture of war-needed synthetic rubber.

A further factor of increased demand for sugar in 1945 was the end of the European war and the ensuing relief and other sugar needs.

The situation was both critical and widely misunderstood. Accordingly a special House committee investigated it, and on May 21, 1945, issued a report which analyzed main causes of the shortage and offered recommendations for dealing with it. Among immediate causes of the trouble, the report emphasized four factors: (1) Diversion of much 1944 Cuban sugar to the production of alcohol for the war synthetic-rubber program; (2) drought in the Caribbean area which reduced the 1945 over-all production in that area by approximately 750,000 below expectations; (3) European relief demands; (4) excessive distribution of sugar in the United States in 1944.

Principal recommendations of the committee, which have since been implemented insofar as they were not effective previously, were as follows: (*a*) Establish authority and responsibility for procurement, transportation, pricing, and distribution under one coordinating head; (*b*) open negotiations immediately for the purchase of the 1946 Cuban and Puerto Rican sugar crops; (*c*) tighten rationing controls; (*d*) reexamine allotments to different classes of industrial users; (*e*) review and adjust foreign commitments to safeguard minimum United States civilian use.

Liberation of the Philippines did not ease the situation. In fact the sugar industry there proved to be in such a condition as to forbid the hope of material production until late 1947 or early 1948. Before Pearl Harbor the United States depended upon the Philippines for about 1,000,000 tons of sugar each year. Consequently, the outlook was for continued sugar rationing in the United States in 1946, although on a somewhat more liberal basis.

Longtime Sugar Problems

In the next year or two the United Nations must find means to increase the sugar supply greatly and at the same time to prevent a recurrence later of great maladjustment between production and demand such as occurred in the 1930's, and led to great distress in sugar producing areas of the world with the enactment of restrictive legislation in this and other countries. Sugar is raw material for many industries. The industrial economies of the United States, the United Kingdom, and western Europe use it in tremendous quantities.

The shortage aggravates their reconversion difficulties. Canners, bakers, ice-cream manufacturers, candy manufacturers, soft-drink bottlers, and others can provide maximum employment only when they can obtain sugar. It is a "must" ingredient for production in many lines.

However, in the interest of both producers and consumers, a long-term sugar program is necessary to avoid the evils of oversupply as well as undersupply. Work is being done on this problem which is of major importance not only to the continental United States but which also seriously affects Hawaii and Puerto Rico. It also affects other nations—including Cuba, the Philippines, Java, and all large sugar-producing areas where the welfare of the people is greatly affected by the price of sugar.

CHANGING WOOL SITUATION

Demand

The termination of the war in Europe has reopened some of the world's largest import markets for raw wool. Continental European countries, where domestic production of wool is relatively small, normally take almost one-half of the wool entering international trade. These countries were largely deprived of imports during the war. Consequently their stocks of wool and manufactured wool products have been reduced to abnormally low levels. Not only are civilian

needs for wool clothing and blankets large, but large quantities of wool will be needed to build up stocks in distributing channels and in mills. Textile plants and machinery in most Western European countries apparently have not suffered extensive damage during the war. But resumption of activity is hindered by scarcity of fuel and transportation, the need for reconditioning machinery, and by other difficulties inherent in the transition from war to peace. Furthermore economic considerations in these countries may dictate a considerable use of synthetic fibers which can be produced from supplies of wood pulp, other cellulose materials, or casein, produced domestically or acquired with less expenditure of foreign exchange. Just before the war considerable progress was reported in the development of special wool-type synthetics in Axis countries. Consequently, competition with wool is likely to increase. In Germany, damage probably has been more severe and recovery there is likely to be slow. In prewar years (1934–38) the German wool textile industry accounted for about one-fourth of Continental European wool imports.

In the United States, the United Kingdom, Canada, and some of the Southern Hemisphere countries consumption during the next few years probably will be considerably larger than prewar consumption, though it will fall below the wartime peak in most countries. Mill consumption in most of these countries reached a record high level during the war, but civilian consumption, especially in the United States and United Kingdom, was limited by large military requirements and lack of labor. Postponed civilian demand and the need for replenishing inventories should greatly stimulate civilian consumption in the early postwar period and make up, at least in part, for the decline in military demand.

Supplies

With a relatively large consumption of wool in the United States, the United Kingdom, and Southern Hemisphere countries, and a reasonably quick recovery of consumption in European countries, the rapid upward trend in world wool stocks which resulted from reduced world consumption and increased production during the war may soon be halted. These factors may, within a relatively short time, open the way for a gradual liquidation of the surplus. A considerable period of above average world consumption will be necessary, however, before the wartime accumulation can be absorbed. The world carry-over of apparel wool at the beginning of the 1945–46 season was equivalent to more than 1½ years of prewar (1934–38) world consumption.

World wool production which reached a record high during the early war years has declined materially during the past 2 years. Production in 1945 was about at the prewar level. Serious drought in Australia, the world's largest producer, and war conditions in Europe were chiefly responsible for the decline in wool production in foreign countries. Although there is considerable apprehension among growers as to the course of wool prices in the postwar period, production in British Empire countries—where about three-fourths of the world's exportable surplus of apparel wool is produced—is being supported by Government purchase programs which will continue

until June 1946, and by plans for Government support of prices while the wartime surplus is being marketed. In the United States more remunerative returns from alternative farm products, together with the farm labor situation and other factors, resulted in a sharp decline in sheep numbers and wool production after 1942 even though the Government has supported wool prices at ceiling levels during this period.

Wool Prices

Foreign wool prices during the next few years will be governed to a considerable extend by the policies of the British Government and British Dominions in regard to price-supporting measures, and the disposition of their holdings, since most of the world carry-over of foreign wool is owned by these governments. These policies, and the policies of the United States Government in regard to price-supporting measures, will be important factors in the United States price situation.

The United States is on an import basis for wool and changes in domestic prices normally follow changes in foreign prices quite closely, although domestic prices are maintained at a much higher level than foreign prices by the duty of 34 cents a pound, clean content, on most imports of apparel wool. Since 1943, prices of domestic wool have been supported by the CCC purchase program at a level considerably higher than the duty-paid prices of comparable foreign wool. Consequently, mill purchases of domestic wool have been relatively small and stocks have accumulated. To correct this condition, and to encourage increased use of domestic wool by United States mills, the Department in November 1945 reduced selling prices for Government owned wools to a level more competitive with prices of imported wools. Support to growers is continuing, however, at previous levels.

Even with Government support, prices received by United States farmers for wool since 1943 have been lower compared with prewar (1935–39) prices than prices received for domestic farm products in general. Sheep numbers have declined to the lowest level since 1928. This has not only resulted in a smaller wool production but production of lambs—which are needed in the nation's meat supply—has declined sharply. Without Government support of wool prices, production of wool and of lambs probably would have declined much further.

TOBACCO

Tobacco had its peak year of war during 1944–45. Few other agricultural commodities, particularly nonfood items, contributed so large a proportion of production strictly to military use. Its high rank with consumers was forcefully demonstrated by the record level of production, the huge volume of products taken for the armed forces, the turbulence of civilian efforts to obtain cigarettes and the heavy movements of leaf tobacco to those countries again able to import stocks from the United States.

Despite an increase of around 7 percent above the previous high record for 1943–44 in leaf tobacco use and factory output, insufficient tobacco products were available during a part of the year to supply the increasingly large demand for civilians. The level of production was more than 50 percent above the 1935–39 average and taxed manufacturers to capacity.

The manufacture of all kinds of tobacco products during 1944–45 increased over 1943–44. Cigarettes, which amounted to nearly 80 percent of the total volume of tobacco products, increased about 7 percent, smoking tobacco gained nearly 17 percent, chewing tobacco and snuff went up about 2 percent, and cigars gained also. Consumer preference for cigarettes continued to dominate. The substantial increase in smoking tobacco may be attributed in large part to consumption by smokers unable to buy cigarettes. Cigar production likely would have been higher if manufacturers had been able to obtain more factory labor. The upward trend in output of higher priced cigars continued but it was slowed down some by a change in the price-ceiling regulations.

About 340 billion cigarettes were manufactured during the year. Although this volume represented nearly an 85-percent increase over 1939–40 production, it fell short of civilian requirements after the needs for armed forces were filled. Approximately 30 percent of the total volume was earmarked for overseas shipment. Additional quantities were required for armed forces stationed in the United States. In total, probably 40 percent of the entire production of cigarettes during 1944–45 was taken for military use. This compares with around 20 percent for 1943–44 and some 13 percent for 1942–43.

Military procurement of cigarettes was stepped up sharply in the fall of 1944. A Nation-wide shortage for civilian consumers ensued. Several official investigations were conducted and generally the situation was attributed to (1) limitations on further expansion of cigarette production primarily because of labor shortages, (2) the large volume of purchases by the armed forces, and (3) the sharp increase in consumption by civilians enjoying record levels of income. Some hoarding by consumers probably aggravated the situation. At the peak of the shortage most manufacturers agreed that lack of leaf tobacco was not a limiting factor. Some apprehension existed that leaf tobacco supplies might become a factor at a later time if the high level of cigarette production was maintained and inventories of leaf were reduced appreciably further.

With the end of hostilities heavy cut-backs in military procurement were made. Soon thereafter civilian channels were filled with ample supplies to meet all demands. No further difficulties from short supplies of cigarettes were envisaged. In fact, since military requirements have been reduced sharply, it is expected that not quite so high a level of production will be required during the coming year to supply all needs.

Record Crops Maintain Inventories

Although the largest use of leaf in history by manufacturers drew heavily against supplies, tobacco growers produced record crops in

1944 and 1945 and inventories have been maintained at fairly adequate levels. Flue-cured and Burley production, the principal types of cigarette tobacco, during the last 2 years exceeded withdrawals. Manufacturers' stocks, which had grown progressively smaller through the war period, have been augmented substantially and will permit a level of cigarette production high enough to fill all prospective demand in the years immediately ahead. This is the period for which apprehension was expressed when cigarette supplies were inadequate last winter.

Marketing quotas on flue-cured and Burley tobacco were continued for 1945. Acreage allotments were slightly larger than for 1944. The flexibility of these quota programs enabled the acreage allotted for 1945 to be approximately 50 percent greater than the allotted acreages in 1940.

In July 1945 the Agricultural Adjustment Act of 1938, as amended, was further amended to require the proclamation of marketing quotas, beginning with the 1946 crop, on fire-cured and dark air-cured tobacco without regard to the level of supplies. A referendum on these quotas was conducted among the growers on October 20. As a result of the vote in this referendum marketing quotas will be in effect for the 1946 crops of fire-cured and dark air-cured tobacco as well as flue-cured and Burley.

Price ceilings established early in the war on flue-cured, Burley, Maryland and the continental cigar leaf types were continued on the 1944 crops. The level of the ceilings was above prewar prices and the large production of the year enabled growers to receive the highest income from tobacco in history. To assure more equitable distribution of the 1944 crops of flue-cured and Burley tobacco among claimants, allocations were continued. Friendly nations which normally have depended on the United States for a part of their tobacco supply shared in these allocations.

The Commodity Credit Corporation continued to handle most of the purchases for export, consisting of the requirements for the United Kingdom and its dominions and colonies. Small quantities were moved into export through regular commercial channels. About two-thirds of the deliveries to the British were for cash and the remaining third for strictly military use was under lend-lease. With the termination of lend-lease following V-J day, all deliveries have been paid for in cash by the British. The willingness to use dollar exchange for purchases of this commodity and the continuation of large requirements following the close of hostilities place tobacco near the top of the list of items eagerly sought by the British Empire countries.

During the war period, 1939 to 1945, Commodity Credit Corporation has handled approximately 1,700,000,000 pounds of tobacco, primarily for use by our fighting allies. About one-half of this quantity was shipped under lend-lease and half was sold for cash. Expectations now are that future purchases of tobacco for export will be made by private companies and that activities of the Department in this field will be confined to price-support operations.

With the easing in shipping conditions to Europe, tobacco exports rose sharply during the year to a level near those of the biggest years

before the war. Mainly this movement represents a change in the location of storage, from the United States to the owning countries, of the substantial quantities of tobacco accumulated by foreign buyers during the war. Since the United States is the largest existing source of the kinds and qualities of tobacco customarily desired by many importing countries a continuing high level of tobacco exports from the United States is expected until low or exhausted stocks abroad have been replenished. When foreign stocks are replenished, however, high prices for tobacco may impede movement from this country into customary export channels. At the same time a continuation of wartime prices for United States tobacco would probably accelerate expansion of sources of supply outside the United States including possibly the development of new sources.

Tobacco producers enter the postwar period with a greatly expanded market for their product. Much of the sharp increase in the domestic market during the war period likely will be maintained. The volume of exports will depend not only upon the price and availability of the leaf but also upon the many complicated factors in world policy on international trade. No segment of American agriculture has a greater stake in the free flow of goods among nations.

FARM INCOME IN 1945

Cash receipts from farm marketings in 1945 may total about 20,400 million dollars—3 percent more than in 1944. The income from crops is expected to be 5 to 10 percent above last year's. On the other hand, the income from livestock and livestock products will reflect decreased sales, particularly in hogs.

In volume the marketings (crops and livestock combined) will be about the same as the record total of 1944. It will include, however, an unusually large proportion of crops from the previous year's harvests. Comparatively heavy marketing of 1944 crops in 1945 resulted from several factors, notably the late maturity of 1944 cotton, the high moisture content of much 1944 corn, the shortage of rail transportation, and administrative orders that delayed tobacco marketings.

Total marketings of crops in 1945 were about 7 percent greater than those of 1944, while marketings of livestock and livestock products were smaller by about the same percentage.

Prices received by farmers in 1945 may average about 2 percent higher than in 1944. Livestock and livestock products will show a greater gain than crops.

Cash receipts from crops showed consistent monthly gains over 1944 up to and through September, especially in the receipts from feed grains. Corn returned a higher income than in 1944; the receipts from oats rose sharply because of the large 1945 crop. Income from wheat increased owing to the sale of parts of two record crops at relatively high prices. Income from vegetables increased substantially; truck-crops prices during June, July, and August showed greater gains over those of 1944 than any other group of prices.

Cash receipts from livestock and livestock products increased only slightly. Despite a small percentage gain in hog prices, income from

hog marketings declined sharply, as a result of drastically reduced sales. On the other hand, income from cattle and calves was higher than in 1944, as marketings were about the same, whereas prices were up slightly. Poultry and eggs returned an increased income, mainly as a result of higher prices. Dairy products earned slightly more income for farmers as a result of slightly larger production.

Net Returns to Farmers

Net returns to farmers reflect production expenses as well as cash receipts. Total expenses of farm production for 1945 may be 4 percent above those of 1944, with increases relatively large in labor costs and in maintenance and depreciation. Wage rates were up about 8 percent, and the value of perquisites to hired workers was up slightly, in line with the higher value of farm products. The total costs of hired labor in agriculture, for wages and perquisites, seemed likely to be about 7 percent higher than in 1944. Expenditures for purchased feed declined.

Charges for maintenance and depreciation increased partly because farmers had more opportunity to replace outworn and outmoded equipment. Expenses of maintenance and depreciation may be from 5 to 10 percent above those in 1944. Farmers are eager to replace old equipment and also to buy fertilizer and lime in increased quantities as supplies become available.

Taxes and mortgage interest showed little change from 1944. Local tax assessments have shown little change throughout the war period, whereas farm indebtedness has decreased.

Analysis of the receipts and the expenditures indicates the net income to operators in 1945 may be about 3 percent higher than in 1944, reckoned without inventory adjustments. Value of products consumed in farm homes may be slightly higher; the rental value of operators' dwellings may show a small increase, in line with some rise that has taken place in real estate values; Government payments will be about the same as last year.

THE PRICE SUPPORTS IN 1945

Commodities for which price supports were in effect in 1945 included the major livestock products (except beef and mutton), the major feed grains, the basic commodities, oil seed crops, dry beans and peas, potatoes, cured sweetpotatoes, sugar beets and sugar cane, wool, naval stores, major fruits and vegetables for processing, and a number of grass and legume seeds. In general, the price support program was a continuation of the levels and methods of supports in effect in 1944.

Price supports for a few commodities were higher in 1945 than in 1944; a few were lower. Those for which price supports were higher included flaxseed, on which a payment of $5 per acre was made to farmers cooperating in the goals program; milk and butterfat, as a result of increases in the production payment rates; certain varieties of dry beans; and Florida and Louisiana sugar cane. Commodities on which price supports were lowered in 1945 included dry edible peas

and certain seed crops. Price supports were discontinued on vegetable seeds, hemp, tung nuts, minor vegetables for canning, and a few seed crops. Oats were the only commodity added to the 1945 price support program.

Three major methods of price support were in operation in 1945—loans, purchases, and payments.

Nonrecourse loans were used to support the prices of the basic commodities corn, wheat, cotton, rice, tobacco, and peanuts for nuts. Loan programs were also provided for flaxseed, soybeans, potatoes in the late potato States, cured sweetpotatoes, dry beans and peas, oats, barley, grain sorghums, rye, American and Egyptian cotton, naval stores, and certain hay and pasture seeds. For some of these nonbasic crops, the support program included other features in addition to the loans.

Price support by means of purchases may involve purchases of commodities direct from farmers or, in the case of commodities which need grading or processing, purchases from processors or dealers. Under the latter method, dealers or processors are usually required to show evidences of having paid growers specified minimum support prices. Direct purchases from farmers have been used as a method of price support for peanuts, soybeans, tobacco, wool, and naval stores. Purchases from processors or dealers have been the major means of support for such products as vegetables for canning, fruits for processing, eggs, hogs, dry beans and peas, and certain hay and pasture seeds.

Under the third major method of price support—that of payments—payments may be made to producers either directly or through the processor or other receiver who buys from the farmer. This method of price support has been used for milk and butterfat, sugar beets, sugar cane, most varieties of dry beans, vegetables for canning, fruit for processing, and flaxseed.

In general, the level of price support for commodities supported by means of loans or purchase operations has been somewhat below ceiling prices. For commodities supported by means of payments, the level at which prices have been supported has generally been above ceilings. The payments have been used as a method of increasing producer returns above what would be reflected by ceiling prices. This has been necessary where ceiling prices were insufficient to assure needed production and where increases in the ceiling prices would have been inconsistent with the price-stabilization program.

Market demands during 1945 were generally sufficiently strong to assure grower returns substantially above support levels, in most cases to the full amount permitted by ceiling prices. Except for those commodities for which payments were made to assure grower returns in excess of those reflected by ceiling prices, extensive price support operations were necessary only for cotton, potatoes, and wheat.

First begun in 1941, the Department's price support program has served the dual purpose of encouraging production of crops and livestock necessary to win the war and at the same time protecting farmers from price declines. The role of stimulating and guiding production has been the major purpose of price supports to date.

It is likely that the role of price supports as a means of protecting farmers' incomes will assume increasing importance during the coming year as wartime demands for food and fiber decrease. As a result of this shift in emphasis of the role of price supports from that of assuring production to that of protecting farmers' incomes, support prices which are above the minimum levels required by law may be reduced. For those commodities for which legislation makes price supports mandatory, the minimum level of supports specified is 90 percent of parity. In order to assure needed production, price supports in many instances have been substantially above this level. Where the needs for the commodity have been reduced due to the end of the war, some reduction in the level of price supports may be made. Thus, a reduction in the support price on hogs after October 1, 1946, has already been announced. In a few exceptional cases, support prices in 1946 may be higher than in 1945. Because of the continued short supply of sugar, an increase in the support price on sugar beets has been announced.

AGRICULTURE'S BALANCE SHEET

As measured by the dollar value of its physical goods, agriculture has increased from a 49-billion-dollar industry to a 74-billion-dollar industry during the 5 years ended January 1, 1945. During 1944 the increase was from 69 to 74 billion dollars. Financial assets such as currency, deposits, and war bonds increased from an estimated 5 billion dollars on January 1, 1940, to 13 billion dollars on January 1, 1944, and to nearly 17 billion dollars on January 1, 1945.

On the other hand, liabilities have decreased throughout the 5-year period. Farm-mortgage indebtedness, estimated at 5,271 million dollars on January 1, 1945, was 364 million dollars less than a year earlier and 1,316 million dollars below the total on January 1, 1940. The 1945 figure was less than one-half the all-time peak in 1923 and the lowest since 1916. Non-real-estate indebtedness (excluding nonrecourse loans guaranteed by CCC) has also shown a slight decline.

With assets growing in value and liabilities shrinking, proprietors' equities obviously have benefited greatly. The proprietors held a 90-percent interest in the physical and financial assets associated with agriculture on January 1, 1945. This proprietary interest totaled 81,820 million dollars, or 8,447 million dollars more than a year earlier and 38,036 million more than 5 years earlier.

This improvement in the financial structure of agriculture has been the result of a high level of farm income. In 1944 total net income from agriculture, excluding Government payments, declined to 14.9 billion dollars, as compared with 15.2 billion dollars in 1943, which may prove to have been the wartime peak. The decline in net income was in the face of rising gross income, which includes not only cash receipts from marketings but also the value of products retained on farms for home consumption and the rental value of farm home.

The decline in net income was caused, in part, by rising operating expenses but the principal cause was in the necessary charge against receipts for heavy inventory reductions. In other words, gross in-

come in 1944 included returns not only from the sale of the enlarged output of that year but also, in a larger degree than in the recent past, from the sale of output of former years. As the result, the inventory of such items for sale decreased 415 million dollars in 1944, largely as a result of decreases in numbers of livestock on farms and to some extent of decreases in value per head.

The wartime rise in prices has been the chief factor in the increase in assets. Real estate, which accounted for 55 percent of total assets on January 1, 1945, increased in value from 33,642 million dollars in 1940 to 50,295 million dollars in 1945, an increase of about 50 percent. Value of livestock and crop inventories has been influenced both by physical increases and higher prices. The index of prices received by farmers for farm products averaged 195 (1910–14=100) in 1944, or about 1.6 percent higher than in the previous year.

The increase in value of physical assets during 1944 was largely the result of a further 4.7-billion-dollar rise in land values. A 394-million-dollar increase in machinery and automobiles and a 250-million-dollar increase in crops on hand were almost exactly offset by a 668-million-dollar decrease in the value of livestock.

The increased flow of income to agriculture has enabled farmers to increase their participation in the financing of the war. War-bond holdings of farmers increased 1,550 million dollars in 1944 as compared with an increase of 1,182 million dollars in the preceding year.

In large part, due to the limitations on expenditures imposed by wartime shortages and priorities, the higher level of wartime income has provided farmers with a substantial reserve of readily realizable assets. In addition to their holdings of war bonds, farmers' holdings of deposits and currency on January 1, 1945, were estimated at 11,600 million dollars, an increase of nearly 2 billion dollars during 1944.

High Liquidity To Be Reduced Eventually

The present high liquidity of agriculture will be reduced sooner or later in all probability whether times are good or bad for farmers. If skilfully managed, the financial assets may enable their owners to adjust farm operations to a profitable basis despite probable large-scale changes in postwar demand for farm products and in the technology of agriculture. In any case these assets will facilitate physical adjustments as these become necessary and are undertaken by farmers. To that extent the growth in financial assets represents a real and a dependable gain. It is true that the purchasing power and usefulness of cash balances and Government bonds decline when prices in general rise.

But the very nature of farm operations compels farmers to maintain a relatively large investment in physical assets, which provide protection against grave injury brought by advancing prices. Historically, rising prices have benefited farmers, and falling prices have brought distress. It is against falling prices that farmers' holdings of bank deposits, currency, and savings bonds provide some protection. And in a situation in which uncertainty of future prices is great it is desirable that both physical and financial assets be well represented on the balance sheet.

The temptation to give a more rosy interpretation to agriculture's current balance sheet than the situation warrants will be lessened by consideration of possible developments which might undermine present valuations. For example, the perpetuation of the current valuation of farm real estate depends largely on a continuation of farm income at levels that so far have never been long maintained in times of peace. Prudent farmers will allow for the possibility of a decline in income after this war when they lay their plans for future operations and as they try to anticipate future values of land and equipment. Similar considerations concerning the other physical assets will have a sobering effect on those whose plans require that the prices of crops and livestock shall not fall. War prices for goods from the farms have seldom survived for long in the postwar eras, and wartime relationships between prices for farm and other goods usually have not endured.

Conservative financial management will recognize the possibility that a considerable portion of the present assets (and equities) may disappear through a fall in prices. Such a fall may not occur, but it is surely a contingency which should not be overlooked, and new commitments should be made only with this possibility in mind.

A part of the financial assets might wisely be set aside to take care of deferred maintenance, conversion, and expansion of plant, as these become possible and desirable. Reference has already been made to the need for heavy expenditures for these purposes. Immediate recognition that heavy outlays may be necessary to maintain the farm plant at a high point of efficiency or to convert it for the production of new crops or animal products under conditions that cannot yet be clearly foreseen may forestall extravagant expenditure of the large cash balances that are now owned by many farmers.

Farmers' Financial Policies

Notably, the period 1940–44 saw less borrowing and more debt paying by farmers than did the World War I years. Correspondingly, the financial position of the farmers showed greater improvement. Obviously, however, it would be a mistake to attribute this gain wholly to the more conservative management given by farmers generally to their finances. Many other factors contributed to the gain; not to recognize this fact might suggest some false conclusions with regard to the relationship between farm debt and farm prosperity.

Actually the relationship between farm debt and farm prosperity is by no means simple, obvious, and unchanging. As many studies in this Department have shown, it is an extremely complicated matter. No formula will cover all conditions. Whether on balance farmers should increase or reduce their borrowings depends on many factors the impact of which varies tremendously from farm to farm and from time to time. Borrowing is sound or unsound in proportion to the chance of using the borrowed capital profitably, and this must be calculated separately for each individual farm. Naturally the postwar years will set new and different financial problems for farmers. If the economic situation should become unfavorable, farmers will

have more difficulty in paying their debts. What needs to be determined for agriculture as a whole and for individual farms is not just the size of the outstanding debt but the relationship it bears to farm earning power. Whether farm debt is good or bad depends on the extent to which it represents an effective or ineffective use of credit.

CREDIT REQUIREMENTS FOR RECONVERSION YEARS

Farm finance in the next few years will reflect changes in agriculture in adjusting to postwar conditions. Long-time trends in farming, mainly more acres in each farm, the wider use of machinery and power equipment, and the mechanization of new areas all will have their repercussions on farm credit.

Farmers will need new equipment; they will need to make repairs, to modernize or erect buildings, and to improve the soil. The large savings many farmers have accumulated in the period of high farm income will be used in part for this purpose. But the change in the group of farmers, mostly younger farmers, will result in a considerable need for credit to finance much of the building, repairs, and equipment.

During the year ended June 30, 1945, veterans of the war just ended became an important factor in farm credit. Indicative of their needs were 923 production credit association loans for about $2 million made to them in the first 6 months of 1945. Also, veterans obtained nearly $1½ million in long-term Federal land-bank and Commissioner loans in the year to purchase farms.

Larger farms call for increased amounts of credit for each individual farmer. This is true both of long- and short-term credit. This, too, may have a bearing on the farm-credit picture, especially in areas depending largely upon one crop.

Another postwar activity of credit agencies will be to assist farmers in shifting from wartime to other crops, and in some areas, to less intensive types of agriculture. Often this may mean smaller income on these farms.

Credit will be needed to get started in farming not only by veterans, but by former workers in war industries and others who plan to farm. Going into agriculture when it is apparent that the peak in farm-commodity prices and farm income may have been reached is a risky venture. Many might profit by heeding warnings in regard to high farm-land prices. This is especially true for those who do not have substantial amounts of money to pay down in purchasing farms. At this time it might be well in many cases for these men to rent farms for a time in the hope that when prices of farm commodities adjust to peacetime levels, farm land can be purchased at nearer normal value rather than at inflated wartime values.

In this transition period, veterans and others thinking of farming or buying farm land might well study the situation following World War I. Many farmers then had incurred short-term debts during and just after the war. Some of these had to be rewritten as farm mortgages. Many veterans, farmers, and others had bought land at highly

inflated values. As a result the farm-mortgage debt of the country skyrocketed to the highest on record. The final outcome was about 2 million farms lost through foreclosure or other default between the two wars.

At present, farmers are in the best financial condition in history. Outstanding evidence of this is that the farm-mortgage debt is the lowest since 1916. Although the increase in real estate values for those who own their farms may be largely on paper, war bonds and bank accounts are tangible evidence that farmers have accumulated money during the high-income period.

Two Contrasting Positions

But farm credit presents two vastly different pictures. On the one hand, many farmers now own their farms free of debt. They have repaid their short-term debts and have money in the bank and in war bonds. In contrast to this are farmers who have bought land at high prices in the past few years.

This trend in farm finance was apparent in the year ended June 30, 1945. In that year, the size of both farm-mortgage loans and production-credit loans increased. In the farm-mortgage credit field, the volume of loans increased both in total amount and size of individual loans, while there was a leveling off in the amount of the demands for farm-operating credit, and a decline in credit to finance the operations of farmers' cooperatives.

Farm credit continued plentiful and, in general, was available at reasonable rates of interest.

Some of the trends in the farm-mortgage field evident since the beginning of the war continued to exert their influence. Of those presenting factors of paramount importance are (1) continued rise in farm real estate prices; (2) further decline in the farm-mortgage debt; (3) increase in the total amount of farm-mortgage credit extended and an increase in the size of loans; (4) a decreasing rate of foreclosure; (5) a substantial decline in the number of farms held by unwilling owners; and (6) an increase in the number and amount of loans being made by individuals.

Farm-land prices are now about 57 percent higher than in 1935–39. While in some areas the increase has been rather moderate, in many others the price of land has practically doubled. In some cases, too, this increased price is based not only on high farm-commodity prices but on war crops and war demand which it will be difficult to sustain if the need for the production declines.

While most farm prices are to be supported for a period after war is declared over, they may not be maintained at wartime levels; this may mean a considerable decline in farm income. Then, too, farm expenses have increased. Taxes are higher and the cost of things a farmer has to buy is considerably higher.

An encouraging sign is the decline in farm-mortgage debt. However, as pointed out, while fewer farmers have mortgages, the amount of each individual mortgage is larger. Figures compiled by the Farm Credit Administration show increases in the size of farm mortgages recorded by lenders for the year ended June 30, 1945, compared with

those for the year ended June 30, 1940, were 88 percent for individuals, 26 percent for insurance companies, 49 percent for commercial banks, and 16 percent for the Federal land banks and Land Bank Commissioner. This increase in size, of course, indicates that more money is going to purchase land rather than for other purposes for which farmers normally borrow on farm-mortgage security.

The amount of farm-mortgage credit recorded in a year has greatly expanded. The increase for the year ended June 30, 1945, compared with that for the year ended June 30, 1940, was 32 percent. Most lenders increased their volume of loans during that period: Individuals 78 percent; commercial banks, 24 percent; and Federal land banks and Land Bank Commissioner, 38 percent.

Declining Foreclosure Rate

Good times have brought a declining foreclosure rate and with it a decline in the number of farms held by lending institutions. At the beginning of 1945, lenders had reduced their holdings to an investment value of $150 million compared with $950 million in 1940. The Federal land banks and Federal Farm Mortgage Corporation, which held 34,425 farms at the beginning of 1940, had 1,410 farms on June 30, 1945.

While it is encouraging that farms are getting back into the hands of private individuals, this has removed one of the forces keeping land prices at reasonable levels as the large number of farms held by lenders in many communities acted as a restraining influence on the market.

Improved farm income has enabled many borrowers with farm mortgages to repay their loans. For example, during the year ended June 30, 1945, Federal land-bank borrowers repaid on average of $3.11 for each $1 loaned by the banks, as compared with $4.53 repaid per $1 loaned in 1943–44. Land Bank Commissioner borrowers repaid $2.41 for each $1 loaned, compared with $3.86 for each $1 loaned in 1943–44.

Favorable economic conditions also are reflected in the financial condition of the 12 land banks. At the end of the year 5 of the banks were operating without either Government capital or paid-in surplus, and 9 banks had no Government capital. A program of repayment of Government funds calls for the retirement of all these funds by May 1, 1946, in each Federal land bank except one. In this year 8 of the land banks declared dividends to the national farm loan associations, the principal stockholders of the banks. Most of the associations in turn paid part of this money as dividends to their stockholders, the farmer borrowers.

The land banks and Land Bank Commissioner have continued to make loans based on appraisals on normal values. Other institutional lenders also are following this practice.

THE RISE IN FARM-LAND VALUES

Developments in the land market during the past year continued to reflect strong stimulating influences. For the fourth consecutive year,

values advanced at an average rate of approximately 1 percent a month. The volume of sales continued at a high level, although moderately under the record high of the previous year. Resales of farms after a limited period of ownership increased in volume. Somewhat over one-half of the sales were entirely for cash. In credit-financed transfers down payments averaged about two-fifths of the purchase price. Despite the volume of cash used to purchase farms, heavy debts were placed on a significant number of properties as the result of sales.

During the 12 months ended March 1, 1945, the land-values index rose 11 percent, and brought the average values per acre for the country as a whole to a level over 50 percent above the 1935–39 level. The largest increases occurred in a number of the Southern States, where advances were about as great as those of 1943–44. In most Midwest States, however, the advances during the past year were considerably under those of the preceding year. But increases in excess of the average rise during the past year for the United States as a whole have occurred in only 2 of the last 34 years. Data are not available for earlier periods. Values rose 15 percent during the year ended March 1944 as compared with 21 percent in 1919–20, the peak year of the World War I land boom.

The advance continued into the summer of 1945. From March to July, values rose an additional 3 percent and raised the United States average to an index level 57 percent above that of 1935–39 and 30 percent above that of 1912–14. The largest increase during the 4-month period occurred in the Pacific region, where values rose about 6 percent. Increases of but 1 percent were reported for the Middle Atlantic and the East North Central groups of States, while values rose 2 or 3 percent in each of the other regions.

Measured from the 1935–39 averages, values in the East South Central States have now increased more than four-fifths; and from the same base the advances in the South Atlantic, Mountain and Pacific States have been more than two-thirds. In many individual States and areas within States, much larger increases have occurred. Average values have more than doubled in South Carolina and Kentucky; they have increased 80 percent or more in Indiana, Colorado, Wyoming, and Arkansas, and more than 60 percent in 14 other States. Values currently are above the boom levels of 1920 in 8 States.

The volume of voluntary sales for the 12 months ended last March was down 8 percent from the record high of the previous year. Despite the decline, the volume of such sales was still about 75 percent above the 1935–39 average and about 5 percent above the peak year of the World War I boom. The largest decreases during the past year occurred in New England, North Central, and West South Central groups of States, where declines of 10 percent or more were reported. The number of voluntary sales declined less than 5 percent in the Middle Atlantic, South Atlantic, and the East South Central Regions.

Purchases by nonfarmers increased slightly the past year, although farmers still bought almost two-thirds of the properties sold. Sales by farmers again increased in relative importance, with sales by corporate agencies dropping sharply with the depletion in their holdings.

Reselling after a limited period of ownership appears generally to be increasing. During the last half of 1944, just over one-eighth of all sales in selected counties surveyed throughout the United States were resales of properties held less than 2 years, compared with about one-tenth during the first half. In selected counties surveyed in the far West, resales accounted for about one-fifth of all sales. The bulk of the farms resold throughout the country in 1944 were held less than one year. The sales-price increase averaged 20 percent or more in most regions.

As sources of credit to finance sales of farms, individuals and commercial banks continued to increase in importance; the proportion of such loans made by Federal lending agencies and insurance companies decreased. During 1944 over two-fifths of the purchase-financing loans were made by individuals, one-fifth by commercial banks, one-eighth each by insurance companies and the Farm Credit Administration, and about one-tenth by other lenders.

Inflationary Forces Strong

The serious attention given to the problem of inflation in farm real estate by farm organizations, agricultural college groups, government officials, and others appears to be warranted. Various forces are operating to push values to inflationary levels. Prices of farm commodities and farm incomes are at record levels; large liquid funds in the hands of farmers and others strengthen the demand for land; the volume of resales shows increased speculative activity, and the demand for land may be further increased, as machinery and labor shortages become less severe. Another stimulating factor will be the entrance of returning service men and war workers into the farm realty market. Values are already beyond levels that are likely to be maintained by long-term farm earnings.

In the absence of effective direct controls, increased reliance must be placed on educational and voluntary measures. Various programs of this type have been sponsored by the Department, by other educational and research agencies, and by various business groups and concerns; they have undoubtedly had a stabilizing influence. But educational and voluntary measures should not be expected to provide the control required to prevent further unwarranted advances in land prices. Perhaps it is time to consider remedial programs to alleviate difficulties that may arise in the postwar period. Such programs will not be needed if high price levels for farm commodities prevail, but if prices fall sharply suitable programs would ease the credit distress likely to ensue.

Consideration might be given to improved debt-adjustment procedures, methods for facilitating the conversion of loans to some type of variable-payment plan, restrictions on the use of deficiency judgments, more equitable and effective debt-moratoria arrangements and measures to enable both private and public lending agencies to better service the credit needs of agriculture during distress periods.

FARM EFFICIENCY AND FARM OPPORTUNITY

Currently our farm production is about a third greater than it was in the late 1930's; it is about in line with the per capita food consumption to be expected with full employment and the equivalent of prewar farm exports. In the next half century our population is likely to increase by at least one-fifth. As a result, we can expect a corresponding increase of one-fifth in market outlets for farm production under conditions of full employment. Changes will undoubtedly take place in farm exports and also in the industrial utilization of farm products, but these would affect a relatively small proportion of the total. What will the indicated probable increase in the demand mean in terms of farm opportunities—in terms of chances to farm or to hold farm jobs?

Between 1880 and 1910 our total population increased 83 percent; simultaneously, our farm production increased 82 percent. Population and farm production rose in nearly the same proportions from 1910 to 1940. Between these years the population increase was 43 percent, while the farm production increase was 37 percent. In each of these two periods, despite a slightly greater increase in population growth than in farm production, the level of food and fiber consumption per capita in the United States advanced a little. This was possible because farm exports gradually declined. The close relationship between population and farm production reflected the fact that food consumption, which accounts for more than 80 percent of the total farm output, is very stable. But we cannot infer how many farmers and farm workers we need simply from the demand for farm products.

Another important factor, namely the efficiency of farming or the output per farm worker, must be considered. This has been advancing rapidly and it is still advancing. Thus farm production may keep in line with total population growth without providing more opportunities for farmers and farm workers. In fact it may do so with an actual decrease in the number of such opportunities. The relationship between production and opportunities, unlike that between population and production, is by no means close. On the contrary, it is divergent. Thus from 1880 to 1910 the United States increased its farm production 82 percent with an increase of only 35 percent in the number of workers in agriculture. In the period 1910 to 1940 it achieved a 37-percent increase in farm production with an actual decline in the number of farm opportunities. This decline was approximately one-fifth.

Technological advance, as reflected in farm-worker productivity, is now faster than population growth. This means that we can achieve an expanding farm production with no expansion and in fact even with a decrease in farm employment. The 21-percent decline that occurred between 1910 and 1940 in farm employment had an offset, from the standpoint of production, in a 73-percent increase in the productivity of the average farm worker. Since productivity per man engaged in agriculture is still increasing faster than total population growth, we must expect a continued slow decline in farm-worker opportunities.

Opportunities for Veterans

Again the country faces the task of finding jobs for its war veterans. Today, as after other wars, many veterans are interested in going into farming. After World War I there were some suitable new areas open for settlement although many new land farms were settled and land was plowed only to be abandoned later because cultivation of it did not pay. But today the outlook for farming opportunities is different. Since occupation of the best of the western land, opportunities for beginning farmers have been limited either to farms for sale or rent in established communities, to limited areas that can be brought under irrigation or cleared or drained for farming, or to less desirable land that was passed over or abandoned by earlier homeseekers, or to land more costly to develop and operate.

A survey made by the Army shows that about as many men are thinking of farming as originally left the farms to enter the service. This survey and letters received by Government agencies indicated that many of these veterans do not have enough money with which to buy and equip a good farm. Some of those interested in farming lack practical farm experience and some are physically handicapped.

In all, it is estimated that approximately one million men now in the armed services are likely to turn to full-time farming as a postwar job. Another half million are thinking of part-time farming to supply part of the family living while they engage in some other regular work. Of those interested in full-time farming, nearly two-thirds, or 600,000, say either that they have in mind farms to which to return, that they own farms, that they can return to family farms, or that they know farms they think they can rent or buy. About one-third, or 300,000, say they will have to look for farms. Only 100,000 appear interested in working on farms for wages. This indicates that the task of finding enough suitable farms for veterans wanting them will be a sizable job.

Farm youth reaching maturity each year are taking over farms. Normally, slightly over half the farm youth stay on farms. Some war workers also will be returning to farms, and both farm youth and returning war workers will be competing with veterans for the farm vacancies available.

Reckoning the Opportunities

Current estimates of farm-land sales, farm rentals, and farm vacancies created by retirement, by changes to other jobs, and by death, indicate that about 1 farm in 7 will be available for a new operator in the first 5 years after the war—or, in other words, about 800,000 farm openings of all kinds and sizes. Only about one-half of these farms are adequate or can be made adequate by farm improvement, by adding more land, or by a combination of the two. Many of these farms are clearly too small or have insufficient improved land and improvements to provide an income sufficient for a family. Some are only suitable for part-time farms and rural residences for workers who earn incomes off the farm. Other farms not adapted to part-time

farm and residential use need to be combined with adjoining farms to make more adequate units.

In addition to existing farm openings, possibly 40,000 to 50,000 new farms can be created to the full-time operating stage by irrigation and drainage in a similar period of time. If all suitable military land is declared surplus, possibly as many as 10,000 farms will be available. Of course, over a longer period several thousand additional new farms can be developed by various means if needed. Present authorizations and plans for irrigation, flood control, and drainage, if carried out, will make it possible to develop 75,000 to 100,000 new farms over a 10- to 15-year period. These developments will also provide supplemental water and protection to many existing farms.

Development of large numbers of new farms calls for a look at production on existing farms and possibilities for increasing it as well as an estimate of the demand for farm products. The trend in number of farm workers has been downward since 1910 while that of farm production has been upward. Farms of the United States are now producing one-third more than they did before the war in spite of labor shortages and scarcity of new machinery and supplies. Prospects are that this increased production not only can be held, but that additional increases in the next few years could bring the total up to 40 to 50 percent more than before the war.

Another source of farm openings is that from hired- and family-worker jobs. There probably will be one-half to three-fourths of a million nonoperator jobs in agriculture for returning veterans and others. These will be needed as women, youths, and children who worked on farms during the war return to their normal ways, and as elderly workers drop out because of old age, death, and infirmities. Many of these temporary wartime workers could do less work than a man; hence, the number of such people leaving farm work will be greater than the number required to replace them. On many farms a returning son will do the work. On other farms a man will be hired. These hired jobs will include some for skilled operators and repair men for farm machinery; some to repair and construct farm buildings, fences, ditches, and other improvements; and some to enable farmers to ease their present war pace. In all, probably as many as 1 to 1½ million farm-operator and other farm-worker jobs will be available in the first 5 postwar years.

Thus, it appears that the actual number of farm opportunities including those on inadequate farms, will just about equal the total number of veterans interested in farming. Maturing farm youth and war workers cannot be omitted from the balance sheet. But job opportunities in other occupations will have a bearing on the number of veterans and war workers and others who want to farm. If there are enough nonfarm jobs for everyone who wants one, then the demand for farms by veterans and others will likely be about equal to the supply of good farms available for new operators. If, on the other hand, there are not enough jobs to go around, then many more people will want farms and will be willing to take almost any kind of farm which will provide shelter, food, and fuel. Most veterans on getting out of the service will have less money than it takes to buy and equip an adequate farm.

Experience in Establishing Farms

Review of recent experience in establishing farms, especially after the last war, indicates some of the factors largely responsible for success or failure. These factors are being considered now by many prospective farmers. Others interested in farming will find it profitable to take stock of the experiences of present farmers.

Land values.—An important reason for many farm failures is that land values and improvement costs were inflated at the time the farm was bought, as was the case immediately after the last war, and both were passed on to the farmers.

Selection of farms.—Selection of productive land is another very important factor affecting the success of a farming business. In some instances in the past, poor land was obtained, or land exceptionally costly to develop or operate, often without adequate community facilities and social services.

Farmer experience.—Lack of sufficient attention to farm experience, knowledge of farming, adaptability, aptitude and desire for farm life is one of the most important factors making for success or failure in farming. A training period for inexperienced farmers is desirable.

Plan for full ownership of land.—Attempts to attain full ownership of land in too short a period is the reason for some failures. The heavy payments required the first few years often make it impossible for the new farmers to live, operate the farms, and improve them. A deferred and variable repayment plan adjusted to income would have been a reasonable solution to this problem and would have prevented many failures.

Follow-up assistance.—An important consideration in establishing farmers on farms often is the provision of technical aid to help them with major problems of farm operation, management, buying, and marketing. Study of some past experience indicates that assistance with the larger problems affecting farm operation at the time of their occurrence would have been very worth while.

Even though good present-day farming opportunities are limited, vacancies naturally occur and will be filled, and well-planned improvement and expansion in farms will keep pace with our agricultural needs. The problem becomes, in part, one of balancing present farms and prospective farms with long-time agricultural production requirements. Allowance must be made for the worn-out marginal and submarginal farms which need replacement, or combination into larger, more adequate units, and for the steep, eroded hillsides which should be retired to grass and forests in the interest of better land use and protection of watersheds.

Stimulation of an unneeded back-to-the-land movement would serve no good long-run purposes either to the public, to the present farmers, or to the new farmers. Instead, it would add to problems of production, conservation, public welfare, and population stability.

Protection for New-Farmer Investment

The success of new farmers in acquiring ownership of the farms on which they settle is dependent to a considerable extent on whether they

have made a reasonable investment in the farm. War conditions have stimulated the farm-land market and caused land prices to rise above normal agricultural earning capacities in many places. Unless a prospective farmer has considerable reserve capital, his chances for success will be materially reduced if he has to pay an inflated price for his farm. One of the chief safeguards for prospective farmers should be prevention of land inflation.

Arrangements might well be strengthened under which prospective farmers and others interested may obtain information about opportunities on farms or on new land, and be helped to avoid unsuitable places. Prospective farmers often get their information mainly from land-selling agencies rather than from qualified, unbiased sources. Information is now being provided by county agricultural committees in many counties, under the direction of the Extension Service. In these counties information is being made available on farms for sale and rent, the kinds of farming adapted to an area, the problems of farming there, and how to handle them. These committees give information on land and rental values.

Buyer's Judgment of the Farm

The prospective buyer usually can well afford to spend a little time investigating land values. Moreover, besides ascertaining what the farm will cost, he should inquire what it will cost to make it productive. A certain amount of cash is usually required for the initial payment; there must be money or credit to pay living and farm operating costs for a time; the land often must be improved or developed by terracing, clearing, draining, irrigating, or fertilizing; buildings frequently must be repaired or needed buildings constructed; livestock as well as farm implements and seed must be purchased.

Nature of Postwar Opportunity

About 800,000 established farms, or about 1 farm in 7, scattered over the agricultural areas of the country, are now operated by elderly farmers who normally will retire soon and by farmers who will wish to change to other occupations. In addition, partly developed and authorized irrigation and drainage projects contain land from which several thousand new farms can be created if funds and workers are available to do the necessary work. Some publicly owned land no longer needed for war purposes may be made available. However, most of this land likely will be bought by former owners and tenants, as they have priority for such purchase. In addition to the farm-operator openings, there probably will be a half to three-fourths of a million nonoperator farm-worker jobs available as women, children, and temporary workers change to other activities and elderly workers drop out.

One of the first requisites of success is an economic-sized family-type farm capable of producing an adequate income. Ownership-operator rights should include credit arrangements that are in keeping with the type of farming undertaken and with the agricultural earning capacity of the farms. Beginners require arrangements suited to

their capacities, desires, and opportunities. Some will enter as laborers; some as tenants; and some as owner-operators. All of these operating arrangements should have recognition in programs designed to guide and give assistance to seekers for farm opportunities.

FARM LABOR

During the war the spotlight was on farm labor as never before. Farm people went into war industry and the armed forces and the farm population declined. Between 1940 and 1945 the net loss through civilian and military migration was approximately 4.5 million actual or potential farm workers. Many other persons shifted from farm to nonfarm work while continuing to live on farms.

This movement resulted in better utilization of the available farm working force, and in programs for using imported foreign workers, prisoners of war, out-of-State workers, land armies, and other unusual groups. On family-sized farms women, youths, and even children replaced the men who had gone away.

A large proportion of commercial agricultural production takes place on farms which use substantial amounts of hired labor. Farm wage rates increased rapidly from their prewar levels in response to the reduced supply of workers and the general rise in wage and income conditions. The Government recruited and placed farm workers, and further supplemented the available supply with prisoners of war and foreign workers. Farmers also adjusted and planned their labor needs more efficiently. They were able to increase their production tremendously, despite a decrease of 13 percent in the number of hired workers between 1940 and 1944.

What will the first years of peace have in store for farmers and their hired workers? The ending of the war in mid-August had no great effect on agriculture in 1945; most of the season's farm work was nearing its end. But by midsummer of 1946 big shifts of manpower from wartime pursuits will have occurred. A net decrease of 8.4 million is expected in the armed forces during the year ending June 30, 1946. Additional millions of workers will have been released from the manufacture of war goods.

Hence the hired-labor situation will tend to be eased during 1946 for the more permanent or regular farm jobs. Farmers' sons returning from the armed forces or from war industries will take the places of hired men. Other returning soldiers or war workers may take farm jobs, especially the better paying jobs on dairy or livestock farms. Some returning soldiers and others who plan to buy farms and become operators but who find land prices out of their immediate reach may work as hired farm hands temporarily.

Inducements for Farm-Job Acceptance

Both soldiers and war workers, however, can draw unemployment insurance. They will generally not be interested in farm work at very low wages. The resent allowance of $20 a week available under the Servicemen's Readjustment Act is somewhat higher than the average cash farm wage paid hired farm workers in March 1945. At

that time less than a third of all male hired farm workers earned as much as $20 in cash wages per week. In the South, where farm wages are lower than elsewhere, the readjustment allowances of returnees may exert an upward pressure on farm wages.

Under these conditions adequate housing and other items furnished free to the worker by the farmer may provide a considerable inducement for returning soldiers and workers to take farm jobs. Many farmers may find it useful to offer a stipulated workweek of reasonable length. Although the supply of labor for good farm jobs should be greater by midsummer of 1946 than in any year since 1942, such inducements will help to offset partially the much lower level of farm than of industrial wages. Moreover, farmers will have a better chance to get able-bodied young men than they have had during the war years.

Situations with regard to seasonal labor will vary greatly in different parts of the country. A farmer who hires only one or two extra workers for fairly short periods, in areas where there is no great seasonal peak, may find it easier to get such workers. Large growers who need considerable numbers of workers for harvests or other operations that cannot be delayed may have more difficulty. Their peak labor needs in wartime were for the most part met from unusual sources—prisoners of war, importees, and patriotic groups of women, high school youths, and other townspeople. The numbers of foreign workers were limited, but they could usually be quickly shifted from one area to another making an efficient and very potent labor force. These sources of labor will be less available now the war is over.

It is not likely that in 1946 the number of migrant workers, who form an important part of the harvest-labor supply on the west coast and in other areas, will reach anything like its prewar level. The living and working conditions of migratory laborers are not such as to attract many recruits unless there is prolonged unemployment.

On the whole, however, enough people will probably be available for farm work if they can be routed to the right places at the right time with assurance of employment at good wages. Efficient distribution, if such can be maintained, will promote the effective utilization of seasonal farm laborers. Methods developed in wartime can doubtless be carried over to peacetime to some extent, though of course without the wartime controls.

Government and private agencies are trying to encourage full employment in the postwar period. Under full employment we can expect the long-time trend in agricultural labor productivity to continue. Production per worker will also be enhanced by new and improved farm machinery. Eventually, therefore, less labor will be required to produce needed food and fiber. It will then be necessary to have more nonfarm jobs.

MACHINERY ON FARMS

In wartime farmers increase the use of their machinery, especially of the more important labor-saving machines. The upward trend in farm mechanization that was evident before World War II began

has continued, as may be inferred from the fact that on January 1, 1945, the number of tractors on farms was 12 percent greater than on January 1, 1942. In combines, corn pickers, windrow pick-up balers, tractor mowers, and some other harvesting machines, the percentage increases were still larger. These gains, however, have been responses on the one hand to the extreme need of economizing the wartime labor supply and on the other hand to the call for maximum farm production. Obviously, such wartime influences will not continue unchanged, and the wartime growth in farm mechanization is not in itself a forecast of what may be expected in postwar years. Nevertheless, purchases of farm machinery seem likely to be at record levels when machines become available.

As an indication of what may be ahead, it may be useful to glance back. In the war years the armed forces and the war industries took several million of farm men, and farm wage rates advanced considerably. In 1944, for example, these rates averaged twice those of 1941. Farmers had to pay more also for new machinery and for tires, repair parts, motor fuel, and incidental services. The increase in the machinery costs, however, was less than in the farm wage rates. In consequence it became profitable under war conditions for farmers to use machinery where previously it would not have been profitable. Had it been available, they would have used much more machinery than they did.

The prospect that the demand for farm commodities will remain high for world rehabilitation purposes suggests that much of the incentive to increased arm mechanization will continue. Farms that have been adjusted to machine methods will not go back, and increased machinery production will enable many additional farmers to increase their mechanization. Probably direct savings in man-labor from the use of farm machinery, which amounted between 1941 and 1944 to an estimated 400,000,000 hours, may amount to an even higher figure in the next 4-year period.

In terms of their machinery supply the farmers were off to a good start when Japan involved us in the war. Production of farm machinery in 1941 was the largest on record; it was much above the average in 1940 and 1939. In 1942 and subsequently machinery production had to be restricted, but 1942 and 1944 were years of relatively high output. Only in 1943 was the production low by prewar standards. True, the output in the war years was below the demand; yet it was not small. Moreover, farmers used what they had to better advantage, through exceptional attention to maintenance and through the use of their machines more hours per year on individual farms and also through pooling. With fewer workers and more tractors and equipment on farms than in any previous year for which estimates are available, agriculture in 1944 raised its production for sale and for use in the farm home about one-third above that of the prewar period 1935–39.

A large reserve of farm machines and liberal wartime production of the more important labor-saving machines compensated not only for the decline in the farm working force, but also to a large extent for the wartime change in its composition. It was necessary to replace young

men on farms with older workers and with women and children. This kind of labor, especially when inexperienced, has difficulty with harvesting by hand methods or with old-type machinery. Under such conditions the work often requires much strength and skill. With modern machinery, women and children and relatively aged workers can do a better job. As mentioned, the supply of such machinery was larger, and the recruits to the farm working force used it efficiently. Aided by machinery, fewer and less skilled workers continued to produce record crops, though they had to cope with shortages of some kinds of fertilizers and of other supplies.

Machinery Increases Marketable Production

Another result of the increased mechanization should be noted; it facilitated not only greater production, but an increase in the proportion available for marketing. It is an old story that the shift from horses and mules to tractor power releases land previously required for producing feed. But the extent of the shift in the war years is of interest. From January 1, 1942, to January 1, 1945, the number of horses and mules on farms declined by about 1.4 million head, and the decline made available for the production of food about 5,000,000 acres of harvested cropland that otherwise would have been needed for growing horse and mule feed. The colt crop in 1944 was the smallest in more than a century. Colt production from 1942 through 1944 averaged only about 470,000 head annually; it would take an annual colt crop of more than 700,000 to maintain the level of 12.3 million head of horses and mules that were on farms in 1945. Work animals on farms have decreased annually in recent years by about 250,000 head, and this rate of decrease is expected to continue. Since 1920 the shift to machinery has released about 50,000,000 acres of cropland and large areas of pasture land for production for sale. Farm mechanization may similarly release an additional 6 to 8 million acres of harvested cropland before 1950.

In the World War I period this country utilized more than 90,000,000 acres of harvested cropland in producing feed for horses and mules on farms and in cities. In 1945 the number of horses and mules on farms was only about 46 percent of the World War I numbers. The nonfarm horse and mule population showed an even greater decline. Because of this reduction in numbers and because per acre yields for feed crops have increased, the country now requires less than 40,000,000 acres of harvested cropland for the production of grain and dry roughages for horses and mules. Our population has increased since 1920 by about 30 percent; yet the total area of land in harvested crops, summer fallow, and crop failure has shown practically no change. Products available from land once used to produce food for work animals now serve human needs directly and help to meet wartime and post-war emergencies. Machinery, in other words, increases both the volume and the utility of the farm output.

Tractors are an important spearhead. Between 1942 and 1945 the number of tractors on farms increased by more than 12 percent, with a comparable increase in most tractor-drawn tillage machines. As previously mentioned, the rate of increase for many harvest machines

has been greater than for tractors. Some machines recently in the experimental stage, such as the beet harvester, the mechanical cotton picker, the field silage harvester, and machines for clearing land, have entered the field of practical operations, though as yet they are of minor importance. Machine milking has increased notably over hand milking; since January 1, 1942, milking-machine installations have increased more than 50 percent. There are now more than 380,000 on United States farms. Along with the increase in the number of farm machines has gone an increase in the amount of work obtained from each. For example, Nation-wide studies show 150 acres harvested per corn picker in 1943, as compared with 100 in 1941.

Outlook for Machinery Buying

Farm mechanization will not lag in postwar years from lack of farmer buying power; farmers have large cash resources. Total purchases may exceed 1 billion dollars annually for several years. In tractors, for example, purchases in the next 5 years are expected to average considerably more than 200,000 annually. By January 1, 1950, the number on farms may exceed 2.5 million. Annual replacement needs will run in the neighborhood of 100,000 units; 10 years hence the demand to replace worn-out and obsolete tractors may approach 200,000. Possibly 150,000 of the tractors now on farms would be replaced at once were replacements available. In addition, many tractors will be needed annually to offset the continuing decline in work stock. Needless to say, the postwar farm demand for automobiles and other transport vehicles will be strong. In the war years the replacement has been very small.

INCREASING USE OF FERTILIZER

On a Nation-wide basis the present rate of use of lime and fertilizers is the highest in our history; yet it would be considerably higher were more of these materials available. Under economic conditions not greatly different from those of 1943, it would pay most farmers to use considerably increased quantities. Specifically, under such conditions, it would pay farmers to use about double the amount of fertilizer they used in 1944, or about four times as much as the average consumption of the prewar years 1935–39. In liming materials it would pay them, under the assumed favorable conditions, to use nearly three times as much as they did in 1944.

In recent decades the use of fertilizers and liming materials in the United States has increased greatly. Thus between the close of World War I and 1930 the use of fertilizer plant nutrients increased about 70 percent. In the depression years of the early 1930's it dropped to nearly one-half of the 1930 level. By 1937, however, the consumption had recovered, and had even gone above that of 1930. There were similar changes in the use of liming materials. Between 1940 and 1944 great additional expansion took place in the uses of fertilizers and liming materials, with the result that in 1944 consumption of fertilizers was 85 percent above the prewar (1935–39) level, while the consumption of lime was approximately 170 percent

greater. Nevertheless, further substantial increases in the consumption of these materials would pay in the postwar years under the assumption of agricultural prosperity.

The present record use of fertilizers and lime is far short of the quantity needed to maintain, restore, and improve our soils. Adequate use of fertilizers and liming materials extends beyond the application of them mainly to cash crops; it includes fertilization and liming for soil maintenance and the development of balanced farming systems. Among other things, soil protection requires a vigorous growth of erosion-preventing and soil-conserving plants. This can generally not be had without a liberal use of fertilizer and lime. In general, however, farm operators do not use fertilizer and lime in adequate quantities for this purpose, partly because the present fertilizer production and distribution capacity is not sufficient and partly because farm operators do not fully appreciate the value of fertilizer and lime in soil management and soil conservation.

Economists, agronomists, and others have estimated the quantities of fertilizer and lime it would pay farmers to use in different areas of the various States. They assumed economic conditions which would provide a national income about equal to that of 1943. In addition, they assumed crop and livestock systems that would maintain or improve soil resources, and be profitable to farmers over a period of years. On this basis the estimates came out differently from what they would have done had the investigators simply considered past relationships between farm incomes and farmers' purchases of fertilizing materials. Specifically, they allowed for applications of fertilizer and lime on a scale regarded as adequate for soil maintenance and soil improvement in an efficient and considerably reorganized production system.

Balanced Farming the Objective

The indicated desirable uses seem large in comparison with current and former practice. This is because they look beyond high immediate production of cash crops to the development of balanced farming systems, and provide also for the maintenance and improvement of land resources. For example, the estimated desirable Nation-wide use of total lime (783 percent of the 1935–39 level) assumes provision for complete coverage, at recommended intervals, of all the acreage of crop and pasture land that needs lime in order to maintain a desirable system of land use. The nearly fourfold recommended increase of total plant nutrients over the 1935–39 level similarly represents not only the annual quantities that would pay but those that would also permit soil maintenance and balanced farming. This tremendously increased use of fertilizers and liming materials is desirable because many farms are seriously deficient in mineral elements and other plant nutrients and cannot be brought up to the level of good management if the missing elements are not supplied. In fact it will be difficult to protect the soil from serious erosion, to broaden the range of crops that should be grown for desirable levels of living, and otherwise to improve the quality of the Nation's food supply while maintaining adequate soil productivity to supply a long-continued high

level of demand. In most regions erosion control depends greatly on soil improvement by means of soil-conserving crops the growing of which requires lime and fertilizer.

Considerable change from current fertilization and liming practice would be necessary. For example, more than half the recommended use of phosphates and nearly half the recommended use of plant nutrients would be pasture and close-growing crops. Cash crops and corn would receive three-fourths of the nitrogen but only a little more than half of the total plant nutrients. This distribution would vary considerably from the present one and would involve increased attention to soil maintenance and balanced cropping, largely through the production of grasses and legumes. In some areas the recommendations call for a much larger use of fertilizers than farmers would consider profitable on a short-term basis. The pay-off would be in terms of facilitating shifts from one-crop farming to more balanced farming systems, of long-time soil conservation, and of more stable average productivity. In many areas greater use of fertilizer and lime is indispensable in making necessary changes in cropping systems.

THE HOUSING OF FARM PEOPLE

On farms in this country there are about 6½ million dwellings, and a recent analysis by this Department in cooperation with the Bureau of the Census has divided them into three main groups—the dwellings that are acceptable, those that need extensive repairs or improvements, and those that are in such bad shape or are so small that they ought to be replaced. One-third are fairly satisfactory, one-third need major improvements, and the remaining third should not be used for human habitation. In short, some two-thirds of the Nation's farm families are ill-housed. The situation reflects the adverse influence of the war, which hampered building and repair operations; nevertheless, it is not to any great extent a product of the wartime shortage of labor and materials. On the contrary, it is an old evil, with roots in the same causes that have impaired other aspects of farm life and given rise to calls for various farm programs.

Farm operators and their families occupy about 5 million of the 6½ million total; hired farm workers, urban workers, and retired farmers occupy most of the remainder. Farm operators occupy the great majority of the acceptable dwellings. Nevertheless, many farm operators have very unsatisfactory housing, about half of them in structures that could be repaired and the rest in structures beyond repair.. As for certain other occupants of farm dwellings, particularly the hired labor group, it must be said that broadly their housing is deplorable, though with scattered exceptions. Particularly bad in some sections are the tar-paper shacks and other wretched shelters of migrant workers. Most migrant farm workers live in dwellings far below urban standards, but the average even for settled farm families is not up to that of city dwellings.

It should not be supposed that the Department and the Bureau of the Census used city dwellings as their standard in making the above-mentioned three-way grouping. They took a much lower standard,

one that could not be called extravagant by any stretch of the imagination. They called many farm dwellings acceptable which lack facilities which the average city family would consider essential, such as electric light and running water. Few farm homes have all the comforts and conveniences that city housing commonly supplies. It is not practicable to equip scattered farm dwellings with everything that close-knit urban communities demand, and programs for improvement in rural housing do not look to that. They aim simply to provide the minimum essentials of health, comfort, and convenience. Even to do that will take more study, planning, and activity than the problem has received heretofore.

What has been done up to now touches only the fringe of the problem. Federal agencies have made loan programs and limited subsidy programs available, but these have affected probably less than 4 percent of the Nation's farm homes. Moreover, the help thus provided has principally covered repairs and additions; only seldom has it financed new construction. Progress in farm housing has dropped behind progress in urban housing partly because urban slums have high visibility and constitute an obvious threat to community well-being. The fact that rural slums exist, though not in the close-packed urban sense, escapes notice, and the country tends to ignore the harmful social consequences. Substandard farm homes, far from main-traveled roads, seem far from the reach of housing programs. We must drop this out-of-sight, out-of-mind attitude and remember that the rural housing problem is also partly a public health problem. Bad rural housing spreads certain diseases and necessitates costly measures to eliminate these maladies. The bad effects concern the Nation as well as the farm people and emphasize the need for broad-gaged Nation-wide action.

Comparison with Urban Problems

One big difference between rural and urban housing problems should be noted. The farm home cannot be developed independently of the farm job, whereas the urban home frequently has no necessary relation to any particular work. Ordinarily, the farm dwelling is an essential part of the whole farm plant, as indispensable as the barn, the granary, or the silo. It is a headquarters for farm operations, as well as a place to live. Even the design should match the function. The farm home must be closely integrated with the other farm buildings and with the farm operations—in short, with the farm itself. Farm housing, in brief, must have an adequate economic basis, either exclusively in the earning power of the farm or in some combination of that earning power with other sources of employment and income. Programs for improved farm housing must consider farm earnings, farm tasks, the size of farms, and other aspects of farming as a job in a way that has few counterparts in urban housing problems.

In farm housing almost everything depends on the farm job, from the size, type, location, and cost of the dwelling to the program for financing its construction and maintenance. Usually the money available for building and maintaining a farmhouse comes from what the farm can earn. Cases in which scanty farm income can be sufficiently

supplemented by earnings or other income obtained off the farm are not typical. Ordinarily, the value of the farm home, actual or potential, depends on the sources of the farm income, so that a loan requested to build or improve the dwelling involves the value of the entire farm. Attempts to put better houses on farms that do not have sufficient income may call for indefinite subsidies and may prevent desirable farm readjustments such as would improve the farm-income basis. For example, farms in some areas are too small. In such areas programs for better housing should begin with enlargement of the farm units. Indeed, farm housing must usually be integrated with other farm programs, especially those that improve farm lay-outs and farm-management systems. It must reckon also with indicated trends and changes in farming, so that, when completed, it will be in harmony with farm operations, farm earnings, and the farm prospects.

Rural Housing Prospects

Even without any special program, we can look for considerable rural home building in the immediate post-war years. Farmers will have savings, part of which many of them will be keen to invest in new homes as soon as necessary labor and materials become available. Other farmers will be eager to repair or remodel their dwellings. Existing credit and other facilities will suffice for much of the expected construction; the credit of many farmers will be excellent, and they will frequently be as ready to use it in improving their housing as in financing the purchase of machinery and other production equipment. Necessarily, however, farm building operations of this type will take place largely on farms where the dwellings are not in bad shape even now. Mainly, such operations will realize building plans that in the war years had to be deferred or will represent new plans that wartime earnings have encouraged. Hence they will not cover the worst spots in the present rural-housing situation and will by no means constitute the maximum possible contribution of rural housing to the supply of jobs. In order to function broadly for the double purpose of raising farm living standards and providing employment, rural housing programs must go into areas and income levels that otherwise would not be touched.

With regard to the poorest farm families, the ones that live on small, eroded, or otherwise unproductive places, farm housing programs in themselves will not suffice. Such families, if they are to stay in farming and live decently in it, must primarily have better farms, or else better opportunities for supplementing their farm incomes. Otherwise, attempts to improve their housing conditions will get nowhere. Lack of sufficient family income will prevent these families from maintaining the improvement, and in a very short time will make their dwellings as bad as ever. But the principle that farm housing programs should go along with other farm programs applies generally. It is not only the poorest farm families whose housing problem extends into other matters; this is true of numerous other farm families who need and want better homes, and who in many cases under favorable conditions could pay for the needed improve-

ment. Farm-tenant families, for example, often have the means to finance better housing for themselves, but the conditions of their tenure situation stand in the way. It is not they, but their landlords, who have the deciding voice. Owner-operators who want better homes must depend on more than simply farm housing programs; specifically, on national programs for maintaining farm incomes, ensuring full employment, keeping up soil fertility, and adjusting farm production-patterns to changing demand situations.

Farm Income Basis of Housing Program

Better housing for farm people presupposes better opportunities for farm people, both to stay in agriculture and to leave it. Briefly, agriculture in some areas must offer better incomes to relatively fewer claimants. Otherwise the improvement of farm dwellings will inevitably lag, because with overcrowding of the land, farming will not meet the costs of adequate housing. To be sure, full employment combined with adequate and steady farm incomes is not the only requirement for a better standard of rural housing. Adequate, well-planned facilities are necessary too. Moreover, we should not wait for full employment to solve the farm housing problem, but on the contrary should see how farm housing programs might contribute to full employment.

Tenant Purchase Operations

Tenant purchase programs can facilitate rural housing. They enable some farm families to get a start on farms big enough to finance adequate dwellings. Good housing for tenant farmers, independently of tenant purchase plans, may require some consolidation of farms for more efficient operation. In the 1930's the average size of tenant farms increased, but on the whole not sufficiently. Since 1940 the average size of tenant-operated farms has increased only slightly. In postwar years, as mechanization and production efficiency increases, an increase in the average size of this group of farms will need to be offset with more opportunities for employment off the land.

The tenant purchase program authorized by the Bankhead-Jones Farm Tenant Act, which has been in successful operation since 1937, illustrates a type of financing which provides improved housing and at the same time facilitates needed farm adjustments. Under this program loans are made for the purchase of economic family-type farm units. These units afford an economic base for the house as well as other needed farm buildings and improvements. This program has been limited in scope and although it is only a beginning, it has financed more farmhouses than any other public program. Approximately one-half of the more than 30,000 borrowers have financed new dwellings in connection with tenant purchase loans.

There is need for basic legislation to authorize loans for farm enlargement. This would make it possible for owners of small inadequate units to be financed in the purchase of additional land needed to round out their farms and afford an economic base for housing and other improvements.

Credit and Other Facilities

Consideration should also be given to developing special credit to landlords to enable them to finance better housing for their tenants. Such housing credit, like tenant purchase loans, should carry a relatively low rate of interest and be repayable under a system of variable repayments over a long period of years.

Among the approaches to better rural housing are research and education. The research should cover the entire setting for the farm home—in other words, the farm itself and the conditions under which it functions. Naturally the investigators should go into problems of financing, of materials, of design, and of construction. They should study the conditions under which cooperative procedures may succeed, particularly in the buying of materials, the pooling of labor, and the joint use of timber, stone, and gravel obtainable on local farms. Other studies might direct the attention of architects, builders, and material suppliers to the special needs of rural housing. The research should deal with farm buildings other than dwellings, since the dwelling is simply one unit in the farm construction pattern and is good only to the extent that it harmonizes with the whole. In education an important need is advice to farm families with regard to their requirements. Many farm families do not realize the extent to which the lack of proper housing injures them. Also, farm families must have somewhere to turn for advice on design, materials, cost, credit, and construction. Together, research and education can help materially to reduce the basic costs of rural housing.

Agreement on Principles

This Department and the National Housing Agency agree that rural and urban people are entitled equally on the basis of need to help from the National Government in efforts to improve their housing standards. They agree, too, that the relationship between farm housing and other farm programs is extremely close. On two other important points the two organizations agree: (1) As much as possible of the required improvement in rural housing should be undertaken by private enterprise; (2) nevertheless, the Government has an ultimate responsibility for helping all families to achieve adequate housing. All types of possible programs, however, will require a large degree of local initiative and responsibility. Eventually, long-range housing projects must be able to stand on their own feet. Hence the use of subsidies, when necessary, should be temporary and should be designed to remove the need for further subsidies.

DISTRIBUTION PROBLEMS

Now that the war has ended, the biggest problem confronting American agriculture is that of finding and holding markets. Farm production has been stepped up one-third during the war in spite of shortages of labor and machinery. The farmer will want to continue full production but he must have markets.

Farmers will have good markets for their products if we have full employment in this country and an active export market. In general, agriculture is prosperous when industry is going under full steam and when all able-bodied people are able to find work at good wages. The farmer has a vital interest in problems of industrial reconversion and in the maintenance of a high rate of industrial activity in the years ahead.

The process of reconversion since VJ-day has worked out reasonably well. Employment has continued high and consumers continue to have enough purchasing power to buy available supplies of foods and clothing at reasonable prices. We expect this condition to continue for several years at least.

Nevertheless, we must realize that some families never have been able to get enough food or clothing even during boom conditions in industry. We must be prepared to help such families at all times. Moreover, we must guard against the possibility of industrial recessions and falling purchasing power in the future.

That the economic well-being of farmers is inseparable from that of the Nation as a whole is demonstrated by the relationship that held from 1929 to 1944 between farmers' income and unemployment. When unemployment rose to almost 14 million people in 1932 and 1933, net income of persons on farms dropped to less than 3 billion dollars—the lowest level since farm income records were begun in 1910. When unemployment fell to less than a million people in 1943 and 1944, net farm income climbed to 14 billion dollars—an all-time high.

Moreover, income trends over the past 16 years reveal that farm income not only rises faster and farther than national income in prosperity but that in depression it drops faster and farther. Between 1929 and 1932 net farm income dropped to less than one-third of its former level, while national income declined only one-half. Between 1939 and 1943 farm income increased 2½ times, while national income doubled.

These data show conclusively that agriculture has a vital interest in maintaining full employment. It has a corresponding responsibility for making sure that appropriate unemployment control measures are prepared and put into effect if unemployment threatens.

Until general economic measures reach the stage of perfection where every consumer has purchasing power to buy all the food and clothing he needs—and to pay fair prices for it—we must be prepared to carry out specific agricultural programs to assure farmers of adequate and reasonably stable markets for their crops and livestock products.

One approach is by measures to develop and to encourage new uses for farm products. Considerable progress has been made along this line. However, neither the farmer nor the consumer is interested in developing any new uses that require permanent subsidies. It may be desirable to subsidize new uses for periods of a few years whenever we are reasonably sure that this practice will help develop a new industry that eventually can stand upon its own feet. But it would obviously be unwise for any Government agency to buy part of the food supply every year and to sell it at a loss for nonfood uses when some families are hungry.

Another possibility lies in cooperating with other countries to bring about a better and more profitable distribution of international food and fiber surpluses. This is a matter for further study and careful consideration. The United States has joined the United Nations Food and Agriculture Organization. This organization is studying various possible ways of improving agriculture and nutrition throughout the world.

It is clear that these ends have not been met well in the past by competitive export dumping. Such measures invite retaliation and drive down prices in world markets without providing real relief for starving populations in various parts of the world. In principle the problem is no different from that of under-consumption within this country. When and if we again have large international surpluses of foods and fibers we must make every effort to make them available to undernourished populations throughout the world on a noncompetitive basis. This will strengthen world markets instead of demoralizing them.

Experience with Food Distribution Programs

Our main problem, however, is to make sure that all consumers here in this country can get adequate amounts of food and clothing. The Department has had experience in the past with such programs as school lunches, the distribution of surplus foods to relief families, low-cost milk stations, food stamps, cotton stamps, and cotton mattresses. Much greater emphasis will be needed on programs similar to these, and we doubtless can improve them in many ways.

School lunches will continue to be a very important outlet for foods. Many local communities have long recognized a responsibility for improving the nutrition of school children. Several years before the war started the Department assisted State and local agencies in a fairly comprehensive program to provide at least one good meal a day for millions of children throughout the country. This program was continued throughout the war in spite of food shortages. It has done a great deal toward improving nutrition and health and toward maintaining markets for farm products. The peak participation in the past has been about 6 million children. This is less than one-fourth of the total school enrollment in this country of 27 million children. Strengthening and expanding the school lunch program should be an important aim in the postwar food program, with the goal of providing a well-balanced daily lunch for every school child who needs it.

In addition to an expanded and strengthened school lunch program we must develop practicable measures to enable the millions of low-income families on farms and in cities throughout the country to meet minimum standards for health and decency in their consumption of foods, clothing, and other farm products. We must never again return to the hunger and semistarvation of the 1930's. Humanitarian reasons alone require this. And, aside from humanitarian considerations, we know that the only way of maintaining satisfactory farm income in the long run is to maintain a high level of food and fiber consumption.

Many of the prewar programs demonstrated their effectiveness both in improving diets and standards of living and in moving surplus foods and fibers into consumption. Nevertheless, we must seek to develop better programs in the future. One outstanding shortcoming of all these measures was that they helped only those families already on relief rolls. Additional millions of families—including farm families—had incomes too low to provide minimum adequate consumption. We must find ways of expanding the distribution of products of agriculture to reach these families. And we must do it in ways that do not involve unnecessary social stigma.

In recent months there has been wide discussion of bills before Congress providing for a food allotment program. Such proposals need careful study before enactment. Many administrative problems will need to be planned for carefully. Experimentation with such a plan on a limited scale would be desirable for testing the most feasible methods of administration.

The most recent food allotment bill incorporates a number of ideas that originated in this Department and that are based upon experience with the former food-stamp plan. The proposed program would be voluntary and available to all low-income families, regardless of relief status. Those who choose to participate would pay a reasonable proportion of their income, and would receive enough coupons to buy adequate diets. The foods would move through the regular channels of wholesale and retail trade. The Government would not buy food surpluses for this program—it would help low-income people buy it in their local grocery stores.

OUR NATIONAL NUTRITION

Abundant food supplies and high incomes during the last few years have combined to make the United States on the whole a very well-fed nation. But a high level of food consumption must be maintained and also the supply must be better distributed as between the higher and the lower income groups. It does not suffice to have a satisfactory average if some groups are far below the average. That is still the situation. To obtain facts on which to base programs for better nutrition, the Bureau of Human Nutrition and Home Economics has made some Nation-wide studies of food expenditure and food consumption at different income levels.

These studies furnish a basis for estimating the general consumer demand for foods under different conditions, and for considering needs of special groups. Even in good times, a sizeable proportion of our population cannot buy the foods necessary for good nutrition. In bad times, of course, the proportion increases. Always a public problem, malnutrition among low-income groups has brought out various proposals for dealing with it. The Bureau's studies and services are helpful in the analysis of such proposals, and in facilitating other approaches to the human nutrition problem.

Obviously the proportion of a family's income that goes for food depends not only on the size of the income but on the number of persons in the family. The Bureau has reported that in 1941 urban families whose incomes per capita amounted to less than $260 a year

spent more than half their incomes for food. There were many such families in all our cities. In these low-income urban groups, among whom allowance must be made for lack of knowledge about food and meal planning, it would have cost in 1941 about $170 per person per year on the average to buy the foods suggested in the Bureau's low-cost plan for good nutrition. In our entire urban population, some 5.4 million households, or about one-fifth of the urban total, could not have spent $170 per person per year for food without allowing for that purpose more than 40 percent of their per capita incomes. Families that must spend even 40 percent of their cash income for food, not to speak of 50 percent, have not enough left for other things.

Farm Expenditures for Food

Farm families usually spend less money for food than urban families spend, but they supplement purchased food with home-produced food. On the average the home-produced food consumed by farm families represents about 60 percent of the total money value of the food consumed. Low-income farm families, however, commonly do not produce as much food for their own use as they should. Programs to improve their nutrition should stress this fact, along with the necessity for higher money income. Adequate nutrition among low-income farm families requires both more food production for consumption on the farm and more cash income to buy other food. Few farmers can produce all the foods they need.

Analysis by the Bureau of data collected in 1936–37 indicated that an adequate diet for low-income farm families would then have cost about $132 per person per year. With 60 percent furnished by the farms, the money cost of the remainder would have been about $50 per year per person. About half the families covered by the analysis could not have spent that amount per capita for purchased food, without allocating for that purpose more than 40 percent of their cash incomes. Farm families like urban families find it a hardship if they must devote so high a proportion of their cash income to food; they have to stint on clothing, medical services, recreation, and other essentials. Only about one-fourth of the families included in the analysis had satisfactory diets.

In the war years farm incomes have been at high average levels; yet large numbers of farm families still have an inadequate living. For example, the Bureau of Human Nutrition and Home Economics found that about 40 percent of the white farm families in a county in Ohio had incomes in 1944 of less than $1,000. In a county in Georgia 70 percent of the white and 87 percent of the Negro farm families were in the group with family incomes below $1,000. With incomes so small, proper eating is difficult if not impossible. It is evident from such facts, and from urban nutrition studies, that we still have a nutrition problem in both country and town.

RURAL HEALTH CONDITIONS

Alarming deficiencies in rural health resources are an increasing source of concern to all interested in rural welfare. The number of

physicians available to serve the population on farms and in small towns has been steadily decreasing. There are too few dentists, nurses, druggists, health officers, sanitarians, laboratory technicians. Over 1,200 rural counties lack approved hospital facilities. These deficiencies reflect the low medical purchasing power that has existed in the past in rural areas. Associated with them, and with related economic factors, is a heavy burden of preventable illness, unnecessary disability, and premature death among under-served rural people.

Postwar planning looking to fundamental improvements in rural health and sanitation has progressed rapidly during the past year. The Working Group on Health and Sanitation of the Department's Interbureau Committee on Postwar Programs has published a report entitled "Better Health for Rural America." This report sets forth five objectives to be achieved in the field of rural health, including easing payment of medical bills, constructing hospitals and other facilities, providing more medical personnel, expanding public health services, and elevating the quality of rural medical care and related services.

Planning and legislation concerned with one or all of these objectives are going forward in most of the States. There have been many conferences of State rural health committees on postwar problems, and several regional health conferences. Regional Postwar Planning Committees representing the Department and the land-grant colleges have held conferences devoted wholly or partly to rural health in Atlanta, Lincoln, Dallas, San Francisco, and Washington, D. C.

Cooperative Health Programs

State Farm Bureaus in some 20 States, mostly midwestern, have enrolled their members in either Blue Cross group hospitalization or hospital and surgical indemnity plans as a benefit of membership. The Grange has followed a similar course in some States. The Farmers Union is exploring prepayment plans for its members, and local units have set up and operate hospitals at Elk City, Okla., and Amherst, Tex.

Several bills related to rural health are now before Congress, including the Hill-Burton bill (S. 191) on hospital construction, and the Wagner-Murray-Dingell bill (S. 1050) which includes new amendments to the Social Security Act, covering, among other things, national health insurance, extension of public health services, construction of health facilities, and maternity and disability benefits.

The Department's Interbureau Committee on Postwar Programs has acted as a clearinghouse for the exchange of reports and plans between the State and regional committees on rural health and sanitation. It has kept these and other groups supplied with current information. Attention has been called to the planning work of the American Public Health Association. Outlines of good State programs, outlines of Canadian postwar health plans, and copies of important health bills have been sent to the State and regional committees. The Committee has supplied specific information on surplus property disposal, procurement of personnel, and other such matters and has answered inquiries from groups interested in State and national planning effects on rural health.

Various agencies in the Department have contributed to rural health, among them, the Bureau of Dairy Industry in protection of milk and dairy products; the Bureau of Entomology and Plant Quarantine in insect control; the Bureau of Human Nutrition and Home Economics in studies of medical care expenditures as well as through research in nutrition; the Office of Labor in examination and immunization of imported farm labor and the provision of sanitary camps and health services for seasonal workers; the Rural Electrification Administration in financing facilities for sanitation and refrigeration for farm homes; the Bureau of Plant Industry, Soils, and Agricultural Engineering in work on engineering problems including housing and sanitation; the Extension Service through education in nutrition, better health, and sanitation; and the Farm Security Administration through organization of hospitalization and medical care plans for its borrowers and through work with low-income farm families to encourage better nutrition, housing, and sanitation.

FARMER DISCUSSION OF WORLD-PEACE ORGANIZATION

Last winter the Department of State asked the Department of Agriculture and other Government agencies to distribute information about the Dumbarton Oaks Proposals, and to encourage study and discussion of them. Accordingly this Department published a discussion guide on the subject written from the special viewpoint of farmers. Also the Department cooperated with the Extension Service and other agencies in promoting discussion meetings throughout the country. The procedure followed was not new in the Department's information system. Previously, however, it had been applied chiefly to matters of special or peculiar interest to farmers. Use of it to explore the implications of a big national question important to everybody was novel, but it proved very successful.

Broadly, the procedure was the same as that followed in encouraging farmers to discuss agricultural problems and practices. First, the Department provided the above-mentioned discussion guide, which outlined the Dumbarton Oaks Proposals and listed the principal questions that would have to be faced. This discussion guide, condensed into eight pages, gave a fair amount of detail on the main features of the proposed World Peace Organization and provided fuller particulars on the related principles of a United Nations Food and Agriculture Organization. It presented the facts and proposals objectively, and avoided emphasis on particular interpretations.

This guide went to all the State extension services and to State farm-organization leaders and other persons. It jumped quickly into wide demand. On requests from the States the Department sent out 125,000 copies at once, and an additional 20,000 copies later. The extension services of 39 States and 2 Territories requested 80,000 copies; requests from other organizations absorbed 45,000 copies more. But the guide was merely a preliminary in the peace education program. It was the ensuing discussion-group movement that really roused the interest of farmers in the specific problems of the peace.

It may be useful to describe this second stage in the peace education program; it shows the extent to which the farmers themselves gathered facts and appraised contrasting views. As developed in previous discussion-group programs, and applied with special care in this one, the procedure avoided handing out views or interpretations ready-made. Usually the discussion leader arranged for members of the group to outline special parts of the United Nations proposals and then raised questions about them. Experts took part only as contributing group members. Speakers gave place to chairmen who simply guided the discussion and kept it to the point, with a view to helping farmers reach their own conclusions.

Typically the discussion meeting brought 25 or 30 rural people together in the presence of a chairman, who usually limited his opening remarks to 5 minutes. After drawing on the discussion guide for key facts, he posed questions. Usually the first answers satisfied no one but pointed the way to better ones. For example, the idea that Hitler caused the war, a frequent starting point, invariably led someone to ask, What caused Hitler, and How did he get his power? Thereupon the group advanced steadily toward clearer recognition of the great economic and political issues involved in the war. Typically the discussion leader kept quiet, withheld his own views, and merely guided the discussion, with an effort to draw out the quieter members and get the views of everyone present.

Farmers' Grasp of Peace Issues

In this way the questions raised indicated answers or suggested doubts. Members of the discussion group came to realize the complexity of the peace problems. They learned far more about it than they could have learned by simply listening to a speaker or reading a book. Briefly, the method stimulated the participants to think the subject through, for themselves, and led them finally to integrated interpretations that would stand analysis. Usually, the first meeting was only one of many. In succeeding days and weeks the discussion continued less formally around dinner tables, in country stores, and in social gatherings. It had a counterpart in hundreds of rural centers in each State. Besides meetings sponsored by State agricultural agencies, many were held by farm organizations, parent-teachers' associations, 4–H Clubs, and other groups. In the approved manner discussion groups stuck to the principle that the leaders should not promote any particular program, but should simply assist farm people to make their own investigations. This worked infinitely better than the old way of assembling people just to be told something. It was more effective from the standpoint both of the interest of the participants and of the ultimate educational results.

In a normal discussion period, lasting say 2 hours or more, the interest came to touch on fascism and on the conditions that produced it; on the world-wide prewar depression, with its mass hunger and unemployment; on the part that trade barriers may have played in bringing on the war; on international competition for land and other natural resources; on the weaknesses that undermined the League of Nations; on means of limiting national sovereignty; and on what a

World Peace Organization should include. Such points came forward, not because a speaker had mentioned them, but because the discussion itself proceeded naturally from superficial to deeper ideas, as is the way of all effective education.

In many cases the discussions resulted in arrangements to publish the findings in local newspapers or to get them on record with the State Department and with Congress. Occasionally the discussion groups included representatives of labor and business, as well as of agriculture.

SURPLUS-PROPERTY ACTIVITIES

By designation of the Surplus Property Administration, the Department of Agriculture is one of 10 Government agencies which dispose of surplus property. Its function is to dispose of surplus agricultural commodities and food and surplus agricultural and forest lands. In addition the Surplus Property Act provides that the Department is to determine the policies to be followed in disposing of surplus agricultural commodities and foods and to cooperate with the Surplus Property Board in establishing programs to facilitate the disposal of surplus property in rural areas.

During the 1945 fiscal year, the quantities of agricultural commodities and food declared as surplus were relatively small. Food supplies in general continued in tight supply and there still were lend-lease requirements that could not be met. Under transfer arrangements developed early in the war as part of procurement coordination operations, foods and agricultural commodities that were in excess of the needs of one Government agency were transferred promptly to other agencies, which adjusted new procurement accordingly. Similar action was taken with regard to many military contracts when reductions in the size of the armed services developed. Declarations of surplus foods and agricultural commodities to the Department between May 15, 1944 and July 31, 1945, amounted to only $1.1 million on the basis of original cost. A good part of these declarations consisted of items classified as food under terms of executive orders (i. e., oils, veterinary supplies, feed), but not used for consumption by humans. Most of the food products for human consumption sold consisted of small lots or items not suitable for program use.

In establishing policies for the disposal of surplus agricultural commodities and foods, the Department took price support and other statutory requirements into consideration; also the fact that much of the surplus foods and agricultural commodities had been procured and held for military use and would require reconditioning, reprocessing, and repackaging. Accordingly, the Department, besides emphasizing fairness and adequate publicity, announced it would discourage disposal operations likely to disturb the economy or permit "dumping." This policy also looks toward maximum returns for the Government. Priorities established by the Surplus Property Act are followed; thereafter, surpluses are offered to the original vendor or processor; to vendors or processors of like commodities; to wholesale food distributors, chain stores, and other groups either directly or through

food brokers; and, finally, to other buyers. Sales must not be made in such a manner as to encourage speculators.

In May the Department was named the disposal agency for surplus agricultural and forest lands. The Board classifies the land accordingly to its most suitable use and assigns it to the appropriate disposal agency. About 21 million acres were acquired for military use during the war period, but approximately two-thirds of this acreage was already in Federal ownership and when no longer needed for military use is returned to the agency which formerly managed it. No accurate estimate can be made as to how much of the 7 million acres acquired from private owners will ultimately be assigned to the Department for disposal as agricultural and forest lands. Some of this acreage may be returned permanently for military use, some will be sold in connection with the disposal of industrial and other plants built for war purposes, and some has been so changed in character during the period of military occupancy that it is not now suitable for the use to which it was previously devoted.

Up to September 1, 41 projects containing 71,596 acres, in 21 States, were assigned to the Department for disposal. As provided in the Surplus Property Act, agricultural land acquired after December 31, 1939, is disposed of in accordance with the following priorities: (1) Government agencies; (2) State or local governments; (3) former owner if he takes the tract acquired from him; (4) tenant of former owner; (5) former owner if the tract he sold is not available and he takes a substitute tract; (6) veterans and spouse and children of deceased servicemen; (7) owner-operators; (8) nonprofit institutions, and (9) others.

Distribution of Surpluses in Rural Areas

In addition to its surplus-property-disposal activities, the Department collaborated with the Surplus Property Board and with disposal agencies in helping to distribute surpluses in rural areas and to farmers. Working with the Defense Plants Corporation of the Reconstruction Finance Corporation, the Department assisted in 54 rural auction sales in 17 States. Approximately 110,300 persons attended these sales; more than 25,300 persons made purchases. About 88 percent of the surpluses sold at the auction had been used in war work. The auctioned items included wheelbarrows, tarpaulins, wrenches, and other supplies and tools.

The Department also cooperated with the Reconstruction Finance Corporation in a Nation-wide sale of motor generator sets. It informed farmers of the availability of the generators, and told them how the sales were to be made. Other programs in which the Department participated included the disposal of farm equipment utilized in the emergency rubber-production program and the disposal of farm-type surpluses remaining from the operation of certain War Relocation Authority camps.

The Department also participated with the Surplus Property Board in the formulation of its Regulation No. 3, which directs disposal agencies to channel surpluses into rural areas so that farmers and farmers' cooperative associations may have an equal opportunity

with other buyers to obtain surplus property. Another feature of this order enabled the Department to aid in relieving threatened impairment of farm production by diverting surplus trucks to specific areas of need.

In addition to these direct activities, the Department is interested in surplus property as an acquiring agency of the Government. It is also interested in the distribution of surplus health and educational equipment which might be used in improving rural health and educational standards. An additional interest is in the extent to which military equipment can be adapted for use in agricultural operations.

LAG IN MARKETING FACILITIES

In the shift from peace to war the need for expanded food production was greater than the need for expanded marketing facilities. On the whole, the marketing system proved to have unused capacity; it was able to handle an increased food output without vast additions to processing and handling facilities. The available plant and equipment were not sufficient for all the increased requirements. For example, the facilities for handling dehydrated food, a comparatively new development, were not adequate at first. Also relatively short were the facilities for assembling, processing, and distributing the wartime production of domestic oilseeds. With these and some other exceptions, the marketing system entered the war period well equipped for its responsibilities. The most difficult problems were not physical but administrative; they were less matters of materials and facilities than of price controls and supply allocations.

Essentially, this difference between the physical and the economic aspects of agriculture's marketing problem will carry over into the peace years. Peace finds us with marketing facilities improved in some ways, expanded here and there, and physically capable of handling continued large production. Whether or not the marketing system will be ready for the task of finding adequate outlets for agricultural commodities is doubtful. This is not a problem exclusively for handling, processing, and distributing agencies; it is one for the Nation as a whole and concerns the entire economic set-up from farm lay-outs to foreign trade. Nevertheless, the problem will show up acutely on the marketing front; it will challenge the ingenuity of processors to find new, better, or cheaper ways of moving farm production into consumption. Even with full employment plus reasonably active farm export trade, agricultural marketing will present numerous problems.

This is evident from the contrast that will exist between the position of agriculture and that of urban industry. Agricultural production will be much larger than in prewar years; geared to war needs, it will continue temporarily with sustained momentum. But the demand will not be the same. Ultimately civilian demand should take up the slack; but an interval of lag is possible. On the other hand, urban industry will have a huge deferred demand; broadly it will not lack markets, but only facilities for producing consumers' goods. Selling will be a minor problem for manufacturers, perhaps for several years.

In proportion as industry succeeds and raises the employment level, it will help agriculture. Nevertheless, conversion will inevitably be more difficult for agriculture than for industry, and the handicap will appear prominently in marketing.

It will be well to look at the basic problem, which the war has masked but not removed. Farm production has never been adequate in all respects for human needs even in the United States, not to speak of other countries; yet output has often exceeded the quantities that could be sold at satisfactory prices. World surpluses have been recurrent. Food surpluses, in the face of widespread malnutrition, are proof that something is wrong with the distributive system, but opinions differ widely as to what should be done. In the years immediately ahead the demand for agricultural products may not fall seriously below the supply, because many countries are practically on famine rations. But what about the longer future? Eventually, with farm technology still advancing and with farmers everywhere back at work, the problem of getting markets will be urgent. The only final answer to large production is large consumption. How to get it is the fundamental question; the ramifications run through the entire body of the economic system, and have counterparts throughout the world.

Naturally, however, this problem has phases which concern marketing agencies directly. It is with these that we deal here; other parts of this report discuss the broader issues. First to be noted is the fact that marketing problems will continue to be the joint concern of private agencies and government agencies. In large measure this was true before the war. Under war conditions it became a more prominent factor.

Effects of War on Market System

In food processing the war emergency has accelerated technological discovery and in some lines also the application of improved technology. In other lines, for example in the commercial development of quick freezing, the emergency has retarded progress, through the shortages it has caused in equipment and manpower. Some developments may be abandoned after the war, such as those necessitated by shortages of shipping space and of refrigeration facilities abroad. On balance, nevertheless, the war years have been a period of innovation and improvement in marketing facilities and methods; this improvement may be expected to persist. New developments have been so numerous that almost a technical revolution is in prospect, particularly in the marketing of perishables. Applied in a favorable economic setting, the new developments should help to raise standards of living here and throughout the world, and to open up new markets for some agricultural commodities. They will create problems as well as benefits, as technological progress usually does; both producers and marketing agencies will have to cope with some new types of competition. But the net result should be highly beneficial.

Among the important new developments are dehydration, the preservation of food by freezing, and air transport. Here it will suffice simply to mention them. In connection with dehydrated foods, it

should be noted that the disadvantages they have in competition with fresh, frozen, and canned products do not destroy their value. Frequently, especially with air transport, dehydrated foods can reach markets inaccessible to other products.

The freezing of fruits, vegetables, meats, and other perishable foods makes it possible to furnish seasonably stable supplies of these foods, and offers many conveniences to consumers. This process may largely influence the distributive system, especially in wholesale and retail trade. Also, like milk dehydration, it may alter production areas.

As for air transport, it will undoubtedly become competitive with other modes of transport. It will widen the marketing range for perishables, and will make varied diets available to previously isolated areas.

Specific Urgent Problems

Breakdown of the marketing problem into components reveals specific urgent problems. It will be important to convert food dehydration to peacetime uses; to provide for the orderly development of the frozen food industry; and to utilize air transport. These are outstanding requirements. Equally important, though less immediate, is the need for research to determine what effects the marketing of dried milk may have on fluid-milk markets and specialized dairy-production areas. Postwar needs in retail food distribution will call for new or improved facilities. Assembly and processing facilities for cotton will demand attention; new developments, such as improved extractor, cleaning, and conditioning equipment for mechanically harvested cotton, should be more widely available. The installation generally of high density compressors at gins and of long-draft spinning equipment in mills is overdue. Oil processing facilities must be adapted to the domestic fats and oils supply.

Further progress is desirable in the use of consumer grades and standards. This need not eliminate private brands or competitive merchandizing; it simply involves the gradual introduction of standard grades for foodstuffs at the consumer end of the marketing system, along lines parallel to those that have been effective at the producer end. Farmers and consumers often protest against the high cost of marketing. Ordinarily, farmers get less than half of what the consumer pays for food and fiber; and though this fact does not result in any large degree from high profits, speculation, or unethical business practices, it is an evidence of relative inefficiency in distribution. On the average, it should not cost more to get a product from the farm to the consumer's table than it does to raise the product. Consumer grades, along with other improvements in marketing, would help to reduce marketing cost.

AGRICULTURAL COOPERATIVES

Farmers' cooperatives for many years have been an important factor in American agriculture. Experience has demonstrated that there is a place for cooperation in an agriculture built upon a foundation of family-size farms, such as we have in the United States. By joining

together in cooperative associations, farmers have gained advantages that go with wholesale purchasing without sacrificing the family-size farm as a producing unit. Legislative bodies, both State and national, have recognized these facts and have passed legislation designed to encourage cooperative activity among farmers. State legislatures in every State have enacted laws providing for the incorporation of farmers' cooperatives. Congress has, from time to time, passed laws designed to remove obstacles and thus permit farmers to organize cooperatives and to operate them effectively.

Today the cooperative movement in this country is strong. Altogether there are in existence at the present time upwards of 10,000 farmers' marketing and purchasing associations, owned and controlled by the farmer members. In 1944 the volume of business transacted by these associations exceeded 5 billion dollars—highest in the history of the movement. In addition to the marketing and purchasing associations, farmers have in operation approximately 1900 farmers' mutual insurance companies, 4,000 mutual irrigation companies, 2,000 mutual telephone companies, 800 rural electric cooperatives, 500 cooperative cold storage lockers, and numerous other service cooperatives such as spray-rings, bull-rings, dairy herd improvement associations, and seed improvement associations.

It is estimated that 3 million farmers hold membership in cooperative organizations and fully one-half million more patronize them without accepting the full responsibility of membership.

Notable Trend in Agricultural Cooperation

One notable trend in agricultural cooperation during recent years has been the development and growth of large-scale business cooperatives both in the marketing and purchasing fields. This has come about through the consolidation of local associations into State-wide and regional organizations for more efficient operations.

Another trend has been a broadening-out of the service rendered by cooperatives; for example, many cooperatives which formerly confined their operations to marketing are now also buying supplies for their members. Some of the large-scale purchasing associations now have installed marketing departments.

A third trend and one which has attracted considerable attention has been the increasing tendency of farmers' cooperatives to branch out into the processing and manufacturing fields. Several of the large purchasing associations, for example, now operate feed mills and fertilizer-manufacturing plants. A few operate oil refineries and sawmills. Savings effected for their farmer members through these operations have been substantial.

Limitations of Cooperatives

In appraising the potentialities of farmers' cooperatives in the postwar period, their limitations, as well as their accomplishments, should be recognized. Farmers' cooperatives cannot upset the law of supply and demand and they cannot assure the farmers a high price nor even a fair price for his product if the purchasing power of the urban

population is impaired. Cooperative marketing is not a substitute for full industrial employment. During the early 1920's, monopoly control became an immediate objective of several agricultural marketing cooperatives on the theory that, if cooperatives controlled a sufficient percentage of a given crop, they could arbitrarily fix prices. Experience has shown the fallacy of this theory.

Cooperatives have little or no control over the total quantity of farm products produced and cannot be expected to deal effectively by themselves with the problem of disposing of surpluses of any agricultural product. When shifts in production of agricultural commodities are deemed desirable as a national policy, cooperative associations probably can best serve farmers by gearing their operations to the requirements of such over-all national programs. Cooperatives are in a position to offer material aid in the administration of those programs which involve marketing, processing, storage, financing, and similar functions.

The place of cooperatives in postwar American agriculture will be decided by the farmers themselves. The Department can and should lay plans for a broad educational program that will carry to farmers the information they must have for properly appraising the potentialities of cooperative action in their local areas. However, specific plans for local cooperative development must be decided upon, initiated, and worked out by the local people themselves on the basis of their particular needs.

WATER POLICY AND AGRICULTURE

Completely successful agriculture in great areas of this Nation cannot be maintained without proper and adequate attention to the use and disposal of water. In most of the West, irrigation is as essential to a sound agriculture as the application of fertilizers and the proper rotation of crops. Throughout the country drainage is a problem which must be solved before some of our most fertile farm lands can be properly used. The Department of Agriculture is deeply interested in the welfare of the farmers who operate irrigated or drained land since irrigation and drainage are an integral part of the agriculture of the Nation.

Irrigation may be divided roughly into two parts, i. e., that part which is developed by private or cooperative enterprise and that part for which the water supply has been developed by the Federal Government. Approximately 80 percent of the land irrigated in the United States today is irrigated by works which were constructed with private funds and facilities. The Department of Agriculture works directly with the farmers on all irrigated land but naturally the largest proportion of assistance rendered is to the farmers residing on this part of the irrigated land of the Nation. In the immediate future, it is probable that Federal project development will become increasingly important. The Department's responsibility has been expressed in legislation, such as the Soil Conservation and Domestic Allotment Act; the flood control acts of 1936 and later years; the Weeks Law of 1911 for forest and water conservation; the Clarke-

McNary Act of 1924 for the purchase of forest cut-over or denuded lands within the watersheds of navigable streams; the Water Facilities Act of 1937; and the Wheeler-Case Act of 1939. The Department handles the unit-adjustment, agricultural-development, and land-settlement phases of Federal irrigation projects handled under the Wheeler-Case Act.

Need for Utilizing Potential Farm Land

There is not too much good farm land in the United States. With normal population growth, a rising standard of living, and continued abandonment of worn-out and submarginal land, the wise and efficient development of our good farm land is a necessity. Two of the most effective ways to do this are by irrigation and by drainage. Much of the development in those two ways must take place by means of rather large and complicated projects. Many factors must be considered in the development of these projects if they are to be successful. For instance, the probable domestic and foreign demands for the farm products which will be produced because of the development should be considered. The probable cost of the development and the ability of the farmers to pay this cost must be carefully determined. Basically, the expansion of agriculture should match the expansion of agriculture's market and, in the long run, we can expect the market to grow. In planning new project development, we must estimate the time it will require to make the new production available. It takes years to get large projects into full production.

Consideration of Regional Interests

Water-development policy as a basic and integral part of national agricultural policy must consider regional and national as well as local interests. Production in one area sometimes competes with and sometimes complements production in other areas and these inter-relationships must be taken into account in all agricultural development. For instance, many bulky or perishable farm products can be used to best advantage near the place where they are grown. Our largest irrigation development possibilities are in the Western States, where the population and, consequently, consumer demand are increasing much more rapidly than in the country as a whole. This relative increase will probably continue, at least for 15 years or so, and will provide an expanding western market for farm production. The associated community developments will, in many instances, draw substantially on eastern and southern farm production for the products which can be grown more efficiently in these areas. Frequently it will be found that the farm products produced on irrigation projects will round out and supplement the eastern and southern production.

That the 17 Western States, which already have about 21 percent of the Nation's population, will have additional gains seems sure. In the first three decades of this century their population increased at thrice the national average rate; in the fourth decade at twice the national average, though this decade included years of drought and of depression. Though the rate of increase may decline, the

absolute gain should long continue. These Western States have 70 percent of the country's coal reserves, vast deposits of other minerals, and great possibilities for hydroelectric development. Their resources have been developed considerably in the war years, notably in steel and aluminum production. Now that the war is over, our trade with the Orient should favor the continued industrialization of the region, and in any case will lessen the shocks of reconversion. The West is not self-sufficient agriculturally; hence, the further development of its agriculture, through irrigation projects, is compatible with the country's total agricultural welfare.

Tie-Up of Water Policy With Broader Program

Effective water policy must be part of a broader policy for the wise use of all natural resources. More specifically, the over-all policy should promote maximum coordinated use on a conservation basis of soil, grass, and trees, as well as water. Also necessary is the development of agricultural skills, of stable and conservational land-use practices, and of satisfactory marketing conditions for the farmers. Without these things, engineering and other knowledge put into dams, aqueducts, and power plants may fail to fully accomplish their intended objectives and may actually result in heartache and failure for settlers.

A further large field in which the Department is and can be of invaluable assistance to irrigation farming is in the promotion of the development and rehabilitation of farms for which irrigation water has already been made available. The discovery and expanding use of new and efficient machinery and methods makes it possible to improve farm irrigation systems with a consequent great saving in both water and soil.

About 300,000,000 acres of our farm lands have already been damaged seriously by erosion. Some 50,000,000 acres have been forced out of production. Another 50,000,000 acres have been damaged so severely that they invite abandonment. On an additional 1,000,000 acres erosion by wind and water has stripped away half the top soil, and on still another 1,000,000 acres erosion is removing top soil inch by inch. Altogether about 40,000,000 acres of land should be shifted from farming to grazing or forests. More than one-third of our 6,000,000 farms are so badly eroded, so infertile, or so small that they cannot yield adequate family incomes. Making good new land available elsewhere obviously facilitates the desired relocation of farm people.

Expansion Largely Dependent on Water Projects

Land capable of being farmed productively without irrigation or drainage has practically all been taken up, although there are limited areas of good forest land that have not yet been cleared. The creation of new farms must rely heavily on either irrigation or drainage operations. In 1934 the National Resources Board published estimates of the potential additional irrigable area. These estimates still appear to be valid, because the area brought into ir-

rigation since then has been relatively small. As of 1934 the Board said about 26,376,000 acres, mostly in the Western States, could be added if costs were disregarded. About 7,114,000 acres were available for irrigation at a cost of less than $100 per acre and some 10,000,000 acres at a cost of less than $200 per acre. This left close to 10,000,000 acres capable of being irrigated at an indeterminate but probably excessive cost. Much of the land which can be irrigated and drained is already in private ownership and is part of operating farm or ranch units. Consequently the problem is largely one of intensifying the agriculture of the area and changing the use of the land.

Agricultural Drainage

Drainage activities develop and improve one of the most fruitful sources of highly productive agricultural land that, because of imperfect drainage, soil saturation or overflow from natural streams, is not otherwise capable of being used for agricultural purposes.

A large segment of our national agriculture is dependent upon lands which have been improved by drainage in order that agricultural commodities could be grown thereon or on which drainage improvements have had to be made to make farming thereon a profitable enterprise. There still remains a considerable area of potentially good land that can be added to our national agricultural plant by the installation and maintenance of drainage works.

According to the 1940 census there are approximately 40,000 drainage enterprises or districts encompassing approximately 27,000,000 acres of land organized throughout the country for the purpose of developing or improving lands for agricultural use. By 1940 these districts had drained 75,000,000 acres of land to a state that it would enable them to produce normal crops.

Today there are within the boundaries of organized districts approximately 30,000,000 acres of land which could be made more productive and the financial condition of the farmers improved if the works installed by the districts were reconditioned or improved. Most of the physical and financial difficulties that are encountered in carrying out drainage activities can be corrected or avoided by the application of available technical resources of high quality to the undertaking and the provision of adequate credit to local organizations and individuals.

An undertaking that affects so large a portion of the Nation's agriculture as does the agricultural drainage operations now being carried on or that might be proposed in the interest of improvement or expansion of works should receive a prominent place in the activities of the Department of Agriculture. The Department provides general research and technical advisory services, carries out work of an emergency nature, and assists individual farmers in agricultural drainage activities.

The Department is well equipped by its experience and resources to be of major assistance in the agricultural drainage field. In connection with its drainage activities, it has, in addition to other work, accomplished the following:

1. Carried on investigations and research in agricultural drainage since 1905.
2. Conducted the largest program of hydrologic and hydraulic research carried on by any agency of the Federal Government.
3. Made examinations and surveys for the drainage, or improvement of drainage, on over 11,000,000 acres of land.
4. Supervised the drainage program of the Civilian Conservation Corps which involved the clearing of 10,800 miles of channel, the construction or rehabilitation of 6,444 miles of ditches and other incidental drainage features.
5. Provided technical assistance to individual farmers and groups of farmers through the medium of soil conservation districts.
6. Made practice payments to individual farmers to encourage the installation of drainage ditches and appurtenant structures on farms cooperating with the Agricultural Adjustment Agency.
7. Provided through the medium of extension, conservation, credit and marketing agencies other programs necessary to the welfare of the drainage farmer.

The Department will constantly strive to improve its drainage program and change it to fit changing needs.

Rainfall West of One-Hundredth Meridian

In large regions west of the one-hundredth meridian, rainfall is usually too scant for crops, and crop production there must depend largely on irrigation. Some 153,000,000 acres have an average annual rainfall of less than 10 inches, and an additional 600,000,000 acres receive only 10 to 20 inches. Each of the 17 Western States that lie wholly or partly west of the one-hundredth meridian suffers to some extent from insufficient rainfall. More than 70 percent of the crop production in the Mountain and Pacific States is from irrigated land, and livestock in these States also depend materially on irrigation for the maintenance of feed production. Altogether, about 40 percent of the country's land surface has too little water for safe nonirrigated agriculture, and efforts to provide the necessary irrigation water will undoubtedly be pushed eventually to the extent of the opportunity which as mentioned is considerable. The western area now served by irrigation is about 20,400,000 acres.

The participation of the Department of Agriculture in irrigation development goes back to the latter part of the nineteenth century. With the passage of the Reclamation Law in 1902, Federal participation in the construction of the engineering works for irrigation projects commenced. Currently, while the vast majority of irrigation enterprises are still financed and controlled by private interests, many new multi-purpose Federal projects are being proposed.

Limited Objectives in Former Practice

In the past, many irrigation developments have been undertaken without consideration of the possible desirable use of all natural resources within an area. Either the need for other developments was not evident, or the necessary technical and other facilities did not exist.

A look back shows some of the things we should guard against. Many early projects had simply local ends in view, and did not consider total watersheds, or the possibility of combining irrigation developments with other developments for use of water. Since these projects were small, relatively little water was involved; but a repetition of the old procedure on a bigger scale might have serious bad results. Formerly, moreover, progress in storing and transporting water ran ahead of progress in the agricultural use of water, costs to the farmers sometimes exceeded the benefits, some unsuitable lands were irrigated, some land became waterlogged, and some became impregnated with harmful salts. Improper land-use patterns developed. Lack of stream-flow records led to attempts to irrigate greater acreages than there was sufficient water for. Some soils reacted unfavorably to irrigation. Knowledge about soil and water relationships has increased, but the knowledge must be constantly applied and augmented. The gap between science and practice has not been closed. If costly mistakes are to be prevented, the gap must be narrowed.

Penalties for Mistakes in Planning

Some modern water developments, because of their enormous scale, entail heavy penalties for mistakes in basic planning. Certain proposals include the irrigation of thousands and even millions of acres, the improvement of navigation on several rivers simultaneously, the reduction of flood hazards throughout whole watersheds, the provision of water for industries and cities, and the generation of hydroelectric power to help defray the costs and to meet industrial, municipal, and rural needs. Projects of such magnitude must be sound from all standpoints, rather than simply from one or two. It is extremely important to reckon correctly the different claims that will be made upon the water supply. Here particularly foresight is better than hindsight. Always to be remembered is the fact that in the nature of the problem the water supply can seldom meet all possible demands.

Promoting the ideal result is a social as well as a technical problem, and requires the collaboration of engineers, economists, agronomists, soils and other experts of agriculture, industry, municipalities, and various governmental agencies. Farm lay-outs, crops, and types of farming must be correctly planned. Land speculation must be prevented. Research must provide information on the desirable and proper uses of irrigation water. Soil must be conserved on irrigated and drained as well as other farms. Range and forest lands must be properly managed. Programs must be developed and expanded for protection of water source areas, along with programs for utilizing water after it has been inpounded. Flood control, a major social purpose, must be coordinated with developments for the use of flood waters. This requires extensive regional consideration.

In the agricultural phases of irrigation projects every detail must advance the settler's chance to earn a living, from the determination of his water charges to the provision of facilities for disposing of his product. Economic as well as technical problems must be worked out; land-tenure problems particularly must be wisely met. In drainage operations the social problems similarly require comprehensive

handling. Drainage as well as irrigation developments may involve community matters, such as those connected with roads, towns, and schools. In this connection too, settlers often have special agricultural needs, in addition to the help obtainable normally through highway, municipal, and school agencies. Project developments involving the development and use or disposal of water as a part of the development of land for agricultural use depend vitally for their success on extremely broad patterns of social consideration and cooperation.

Integration of Agricultural With Engineering Aspects

Good handling of the agricultural phases of irrigation projects is as important as the proper location and design of the engineering works. Planning of the farm units necessitates proper consideration of soil and slope factors, study of crop and market possibilities, and attention to basic land-tenure needs. Current practice should try to settle these questions properly from the start, because farm patterns established originally may last for generations and, in any case, can be altered only with great difficulty and at great expense. Thus it is important to obviate initial errors. The Department is equipped to handle the agricultural phases of irrigation projects and stands ready to assist settlers by furnishing advice and technical and other assistance in constructing farm irrigation facilities, in establishing field and farm layouts, in clearing and breaking out the land, in selecting crops, and in constructing improvements. It has the staff and the experience, combined with required broad economic information, for helping to integrate irrigation projects with our total agriculture.

SOIL CONSERVATION SERVICE

America can do a considerable part of her farm conservation job in the next 15 to 20 years if adequate technical help, labor, and equipment are available. These things are essential to getting a complete program of erosion-control, soil-building, and sound land use measures on all of the more than a billion acres of United States farmlands.

This estimate is based on an intensive and continuing study of the Nation's conservation needs by the Soil Conservation Service. The Service is studying not only what needs to be done but what will be required to do it.

The results of the study show that the work is urgent. Part of it is almost of an emergency nature, so disastrously has some of the land been used. All needed work should be done as soon as possible, to keep lands now only slightly damaged from reaching a stage that calls for emergency action. It should also be kept in mind that after conservation measures have been applied to the land, every effort must be made to maintain them. This will call for greater educational effort, so that people may understand and accept the fact that proper use and care of the land are the foundation of a sound agriculture.

Progress has continued in applying conservation measures to farm lands during the war, but the over-all picture of the condition of United States croplands, pastures, and farm woodlands is not enough better than it was a year ago to warrant complacency.

For one thing, despite application of soil and water conservation measures to more than 71 million acres of farmlands, there still are hundreds of millions of acres more of our farm and grazing land that need treatment. For another thing, the war has caused some land damage in many important cropping areas. Allied to this, and in contrast with the situation a year ago, is a growing threat of trouble in the so-called "Dust Bowl" area.

Prompt action is needed. The biggest and most important of these problems, of course, is the Nation-wide soil erosion and exhaustion that has been under way for a century and a half to two centuries. For instance, about 300 million acres of United States cropland need erosion-control and yield-increasing practices such as contouring, strip-cropping, terracing, and so on. There are 90 million acres needing terracing, and 212 million acres needing good crop rotations, including grasses and legumes. Other millions of acres need improved drainage, irrigation, and other work. Land use changes are needed, too. Some 44 millions of acres now in crops should be returned to grasslands or woodlands. These things cannot restore to the erosion-scarred land the richness it had when the white men came, but it can prevent further damage and help reclaim for continued usefulness some of the land we have almost ruined.

The problem of war damage to the land is less grave. This damage is of three types, and is widely scattered over the country.

First is the plow-up of land unsuited to cultivation. It is impossible to know exactly how much of this land there is, but it is estimated at around 2 to 3 million acres, much less than during and just after World War I. Acreages of clean-tilled crops essential to the war effort, such as peanuts, soybeans, vegetables, and corn, were necessarily increased in many parts of the country. One example is the report from the Northeastern States which shows that a considerable area of hay land, which normally never feels a plow, was broken to grow soybeans and vegetables. Inevitably, where conservation measures are not used in growing such crops on sloping lands, damage results.

Second, many farmers who had crop production goals to meet undertook to meet them by omitting the legumes from their crop rotations. This resulted not only in loss of possible leguminous forage crops, but also in a sharp reduction of the amount of organic nitrogen in the soil and an increase in erosion and loss of rainfall as runoff.

Third, available organic plant foods and organic matter in the soil have been reduced by intensive cropping, causing some deterioration of the land in some areas. Shortage of commercial fertilizers probably has aggravated this situation. It should, however, be pointed out in connection with the second and third types of war damage, that they have been offset in some measure, although not entirely, by thousands of farmers who have continued to plant cover crops and plow them under to add humus to their fields.

The situation in the Dust Bowl area still is a possibility rather than an actuality. A great deal of successful wind-erosion control has been done in both the southern and northern plains, but some dust storms may again give trouble when prolonged drought hits. A good-

sized land boom is under way, with its attendant evils. A heavy demand for wheat and good prices have brought about abnormal demand for this land. In parts of the region, some absentee landowners are having land plowed that should be left in grass or grain sorghums. In a few instances, owner-operators have forgotten what occurred a decade ago and, encouraged by favorable moisture conditions, are plowing up grasslands again. These conditions are not universal in the area, however. Reports from Cheyenne County, Colo., for example, show that none of the approximately 100,000 acres grassed and returned to livestock in that county after the drought of the early 1930's has been plowed up, and is not likely to be.

Estimate of Lands Treated

Year-end figures of the Soil Conservation Service show that by June 30, 1945—end of the fiscal year 1945—complete soil and water conservation treatment has been applied to 71,692,000 acres of farm lands. This figure is by no means all cropland; it includes farm woodland, pastures, and range land as well.

The discrepancy between the amount of land on which complete conservation programs have actually been applied and the area on which they are needed is due principally to the fact that erosion has been at work on the farm lands of the United States for more than a century and a half, while the organized national program to control it has been under way for only a little more than 10 years. However, there is another factor that is of particular interest now. This is the manpower factor.

It has been impossible, because of war demands for manpower, to keep as many technicians at work on the conservation job during the war years as before. But the manpower situation may be improved within the coming year.

This is important, because an estimated total of 3½ million man-years of skilled and unskilled labor will be needed. This will necessitate an increased technical staff to supervise the task. The Soil Conservation Service, on the basis of its study, estimates that it will be necessary to train about 15,000 technicians at the rate of 1,500 a year for the next 10 years to give farmers the technical aid they need and already are requesting. The job will also require equipment and a system for actually getting the work done on the land.

The soil conservation districts now in operation in 45 States provide the most effective channel for putting soil and water conservation practices on the land. At the close of the fiscal year, 1,328 soil conservation districts had been established. Most of them already have completed or have in preparation over-all district programs for carrying out the postwar work needed to complete the conservation job in their respective territories.

These district programs, prepared by the districts' boards of supervisors made up of farmer cooperators, are based on the total needs of the districts. The needs of each individual farm are ascertained

and consolidated to determine the size of the total job. From this information, district supervisors figure equipment, man-hours of labor, horse-hours, and technical aid necessary to get the job done.

Soil conservation districts not only are the most effective agency for applying soil and water conservation measures to the land; they likewise are in a position to help in a special phase of the postwar readjustment. Thousands of returning servicemen are planning to return to farming or to take up farming. Many districts have foreseen this and have made plans for helping and advising these veterans.

One important feature of all district postwar plans is provision for shifts in land use where necessary. Wise use of the land is of the utmost importance, and the foundation of all permanently successful agricultural operations. It involves using each parcel of land for the crop it is best suited to grow, and developing and protecting it according to its needs. This basic information is included in the help the districts are prepared to give to veterans.

Two major benefits of the postwar conservation job will be maintenance of the treated land for continued full production, and increased yields from the treated acres. Many hundreds of farmers, in fact, have reported that despite reduced acreages of clean-tilled crops, brought about by land use shifts, their total production of these crops has gone up because the treated land has produced greater yields.

IMPROVEMENT OF WESTERN GRAZING LANDS

Our increasing population, along with the relative scarcity of additional land suitable for crops, necessitates increased effort to improve lands suitable for grazing. Western grazing lands are a principal source of food livestock and the basic range resources—soil and forage—must be conserved. Range livestock operations based on conservation principles produce increased economic returns, as recent experience fully attests.

The return to a peacetime basis requires a new stock taking of grazing resources. A method of classifying ranges according to their condition has been formulated, and it is being used widely throughout the western range States. Extended to cover all western ranges, it should be of great value. Facts about the potential productivity of our range land resources as a whole are being accumulated. When available for individual farms and ranches, such facts will enable livestock operators to determine where improvement is most needed and to plan better range management.

Growing conditions on western ranges were generally favorable during the war years, and provided forage for range herds in numbers never equaled. Adjustment to safe grazing capacity, with allowance for reduced forage production in periods of drought, is considered by many ranchers to be advisable. Needed downward adjustments should be made during this year and next while needs for meat are still large and prices good. It is risky to wait until the demand declines.

Some ranchers are already making heavy reductions in their livestock to avoid overuse of the range. They are getting compensation

in the form of improved conditions in their breeding herds, gains in calf and lamb crops, increased weights in their salable animals, and reduced livestock death losses.

The Department's program for the conservation of range resources includes:

1. Wider extension of on-the-ranch technical assistance through soil and grass conservation districts.
2. More effective management of range lands under the custodianship and control of the department.
3. Further study of the range to determine principles of range use and protection, and to indicate opportunities for land use conversion.
4. Plans for better coordination in the use of interdependent public and privately owned ranges.

Farmers and ranchers will have to do most of the work. They will need local leadership and organization, and also information, research, technical assistance, and financial aid in meeting the costs of certain practices. This Department will help with extension work, research, credit facilities, disease and insect control, and conservation.

POPULATION GROWTH AND THE FOOD DEMAND

Basic in the food demand is the size of our population, which is still increasing rapidly. In the war years the rate of increase has been accelerated. The wartime increase in the number of births has far exceeded our military losses, though these have been much greater than those of World War I. Since 1940 our population has increased annually by about 1½ million, as compared with an annual increase in prewar years (1935–39) of only about 925,000. This represents an increase of 8 percent from the 1935–39 average.

With export demands unchanged and with per capita domestic consumption likewise static, this 8 percent increase in the population would have required an equal increase in food production. Actually, both exports and per capita consumption at home have increased. True, wartime conditions do not afford much basis for long-time forecasts; conceivably, exports in peacetime will be smaller, and the decline will lessen the need for increased production to keep up with population growth. Nevertheless, the population factor will continue to be a major determining influence in the farmers' market.

In the immediate postwar years the birth rate may continue at the relatively high wartime level. One probable cause will be the return of men from the armed forces; another will be the high proportion in our population of women in the early child-bearing age. Birth rates in the early 1920's were high; the girls born then are young women now. Nevertheless, the outlook in the longer run is for a decline in the rate of population growth; in fact the period of exceptionally rapid growth may end soon.

Population trends are of course inherent in the present make-up of the population—in its size and composition. Our present situation is the composite result of almost a century of births and deaths; and

our situation in the future will be the outcome of what it is now. It is probable, unless we reopen our doors to immigration or unless the wartime growth continues in a manner contrary to past experience, that by the end of the century our population will have ceased to grow. But this reckoning advances the stopping place beyond the point at which statisticians put it formerly.

Vital statistics are of the greatest importance to agriculture; but they are not, of course, the sole determinant of the domestic food demand. Heretofore, our people generally have not had all the food and other agricultural products they have needed. With high employment and a better diffusion of buying power, farm production for domestic consumption may increase beneficially at a greater rate than that at which the population grows. But the indefinite automatic growth of the domestic market, simply as a result of population growth, cannot be permanent.

Distribution of Population

Agriculture's interest in the population question extends beyond the mere numbers involved; it concerns also the distribution of the population—especially the distribution between town and country. Since 1940, though our population has been increasing, the proportion of it that lives on farms has been decreasing. More than 5,097,000 persons have left the farms, either for service in the armed forces or for the cities, towns, and villages. In all our history, which has seen much migration from the farms, nothing on this scale has ever taken place before. At the beginning of 1945 the number of people living on farms had been reduced to 25,190,000.

By April 1944 two-thirds of the young men and two-fifths of the young women who in 1940 were between 20 and 25 years old had left the farms. More than one-fifth of all the persons who in 1940 were more than 14 years old had moved away. This was not the entire drain on agriculture's working force. Many persons who continued to live on farms took nonfarm jobs nearby; about one-fifth of the farm households in 1944 reported that the head of the family was working chiefly at some job other than farming. Nearly one-third of the farm operators in 1944 reported having done some nonfarm work during the previous year. Farm operators contributed a total of 285,000,000 man-days of nonfarm work in 1943.

Manifestly, the return to peacetime conditions will bring further changes in the distribution of population between town and country. Some return flow to the farms may take place, especially if urban unemployment develops. In the war years the heavy drop in the farm population was a handicap to agriculture. It does not necessarily follow, however, that a reversal of the trend in peace years would be a benefit. Agriculture may then have more interest in full maintenance of its market than in full restoration of its prewar working force. Previously, under peace conditions, some reduction in the number of people on farms has been desirable, because agriculture has been overmanned. Many farm people have been living on farms that are too small or too lacking in fertility.

Heavy Landward Flow Not Desirable

Certainly, the most favorable development both for agriculture and for the country as a whole will be one that does not require a heavy peacetime return flow of population to the land. The best hope for many of the people who have left the farms is that they will continue to have satisfactory nonfarm employment. An economy that provides full-time employment will not need these people in agriculture, which has technical resources capable of increasing the output sufficiently with no increase in the farm working force. Needless to say, this does not mean that agriculture should absorb no new personnel. On the contrary, the personnel must be recruited constantly as in all occupations. Many veterans, for example, may wish to enter or reenter farming, and facilities exist to help them. The essential matter is the balance between the rural and the urban population. Continued technical progress in agriculture reduces the manpower required, and the logical offset is an increase in nonfarm opportunity.

FARM SECURITY ADMINISTRATION SERVICES

The Farm Security Administration's program of services to low-income farmers has operated in a depression period and in a period of high employment with heavy demand for farm products. It is now entering a third, or postwar phase.

The FSA started as a subsistence program. Gradually it evolved during the prewar years into a plan for orderly rehabilitation of worthy but impoverished farm families with an ultimate goal of family-farm ownership. When the war suddenly expanded the farmer's markets and drained off much of the surplus manpower among low-income rural families, FSA's program of credit backed by practical on-the-farm planning and guidance provided a basis for increasing food production on the family-type farm. It enabled many small farmers to produce at nearer the full capacity of their available manpower and land resources.

In the conversion and postwar period now beginning, FSA is continuing its services to disadvantaged farm families, but an increasing portion of its work will be with returning servicemen and war workers. Many of those who will return to agriculture grew up on small, inefficiently operated farms, and have only a limited background of training and experience in modern agricultural methods. Their cash savings will not cover all expenses of family living and farm operation while the new start is made. Farm Security's task, through credit and guidance, will be to help them get established on farms with a reasonable chance for success.

Loans to Veterans

In carrying out its new responsibilities toward veterans during the last 12 months, Farm Security drew on a decade of experience in rural rehabilitation, and 8 years' experience in administering the Bankhead-Jones Farm Tenant Act of 1937.

More than 3,000 rural-rehabilitation loans were made to veterans unable to obtain operating credit from other sources, and they received individual guidance in starting on land they rented or already owned.

Sixty-six farm-purchase loans were made to returned servicemen, whose eligibility for the farm tenant program was specified in the Servicemen's Readjustment Act of 1944. In each case careful attention was given to making sure the farm was one on which the veteran could earn an adequate living while retiring his debt.

County FSA committees, who pass on all applications for Farm Security assistance, were asked to act as special certifying committees in connection with the farm-loan guarantees for veterans provided in another section of the GI bill. Committeemen certified 406 veterans as eligible for guarantees of loans made by private lenders for the purchase of farms or farm equipment.

The Trend in Rural Rehabilitation

Families farming with FSA loans and supervisory services throughout the year definitely strengthened their positions. Field workers in the 2,000 county offices concentrated their efforts on helping these families make fundamental adjustments and improvements in their farming, so as to put their financial affairs on a sound basis assuring continued success and stability in postwar years.

The average family farming with a rehabilitation loan cultivated more acres in the 1944 crop year than in 1943 and ended the year with more working capital, greater net worth, and a smaller debt to FSA. Borrowers' cash income from crops and livestock averaged $1,395; including the value of the food and fuel they produced for home use, the gross farm income was $1,836. Farm operating expenses averaged $810, leaving a net farm income of $1,026. The families' net worth—the value of what they owned over what they owed—averaged $2,522 at the end of the season. The comparable figure for 1943 was $2,300.

More than 78,000 families made final repayments of funds borrowed in earlier years for essential machinery, livestock, and farm and home needs.

Demand for new rural rehabilitation loans continued heavy, as it has been throughout the war. Despite the Nation's all-time high records of total farm production and total farm income, all farmers have not shared alike in the benefits of a period of rising prices and unlimited demands for their products. Many have not enjoyed prosperity because they have continued to farm with inadequate land, capital, and methods.

From this group of the farm population, more families applied for loans than could be aided with the $67,500,000 available. Farm Security made 24,996 new loans, and 102,890 supplemental loans to families already operating with FSA credit. To aid as many eligible families as possible, FSA limited the amounts of loans, and, through the county committees, reviewed the progress of all borrowers whose loans had been outstanding three seasons or longer to determine whether they should receive further assistance or be graduated to private credit.

Nearly 300,000 low-income families were active in the rehabilitation program during the year; they received individual guidance in overcoming, through their own efforts, the problems which prevented them from attaining the benefits of the generally favorable agricultural situation.

Farm Security workers directed more attention than ever before to the broad agricultural problems commonly faced by borrowers which often cannot be overcome by individual effort alone. A system of appraising the farm and family resources of the borrowers in each county was begun. This provided facts from which to chart the course for general improvement of the county program.

These appraisals showed that the most common needs were: More farm income, greater utilization of family labor supply, larger acreages in winter grain, improved health conditions, home gardens, more home canning, greater production of livestock and poultry.

Efforts to solve these problems took precedence over all other activities. To earn more farm income, borrowers were urged to have at least two main sources of cash income. Supervisors stressed the use of improved varieties and better farming practices, such as spacing, planting on time, and balancing commercial fertilizer with organic matter. One step toward better health conditions was the further development of group hospitalization plans.

Committees and supervisors were guided by the realization that after the war the speed with which borrowers can repay debts will decrease with the decrease in the present spread between farm income and expenses. They encouraged families to strengthen their financial positions by reducing dollar indebtedness, by avoiding an overextended debt structure based on deceiving inflated values, and by using efficient methods and accumulating resources which will insure good incomes in later years. In the war years, perhaps more than in earlier years, borrowers have looked to FSA supervisors and committeemen for advice on better farming methods. But even more important to the farmer has been the judgment of supervisors and committeemen in helping him plan basic adjustments that mean a firm foundation for the postwar period.

Thus the exceptionally high repayment record during the last year reflects more than the general improvement in markets and prices. It reflects the results of previous planning, and the basic changes which have increased productivity and given real assurance of postwar stability.

Ownership of Family Farms

Because of the rising real estate market, extreme care is taken in the tenant purchase program to avoid the dangers of inflationary land prices. Loans are made only to applicants who can find good land for sale at prices in line with earning-capacity values as computed on the basis of long-time average prices for farm products. Careful appraisals are emphasized more than ever before, to make sure that only sound buys are approved. Farm Security's stand against inflation is helping many farmers, and others as well, to appreciate the risks involved in buying farm land at boom prices.

The fact that farm real estate prices have not risen uniformly over the Nation makes it possible to continue the program. Prices have advanced much higher in some areas than in others. Thus more farms than usual failed to "appraise out" in 1945. The 1,870 loans approved during the year averaged $5,942, as compared with an average of $5,994 in 1944 and $5,721 for the 5-year period 1938–1943. Of the $15,000,000 available for loans in 1945, $11,699,846 was used. Some States used all their funds and readily could have made additional loans, while in other States some money was not used because sound buys could not be found within price limits. The law does not provide for transfers of funds between States since funds are allocated according to farm population and prevalence of tenancy. Applications for loans were heavy in all States.

Fifty million dollars is available for farm purchase loans in 1946—half of it earmarked for World War II veterans. Since the law permits greater flexibility in the distribution and use of funds for veterans' loans, more "shopping around" for good farms for sale at earning-capacity values will be possible and the program can be conducted somewhat more advantageously than last year in spite of the abnormal land-price situation.

Since 1937 nearly 38,000 tenant and sharecropper families have bought farms through this program. Their repayment record has been good each year, but the past year's record was the best; 1,104 families paid the balances on their 40-year loans from income years ahead of schedule. Sixty-six percent of the borrowers following the variable payment plan were ahead of schedule, as of March 31, 16 percent were exactly on schedule, and 18 percent were behind. Of those following the older plan of fixed annual payments, only 13 percent were not current or ahead with their payments.

From the 8 years' experience with farm-purchase loans have come conclusions that set the standards for the expanded program in 1946 and for the postwar years. Data compiled by FSA show considerable evidence of the correlation between size of the investment and success of the enterprise; a small investment in a farm is usually associated with a small income. Borrowers' records show that, on the average, an efficient family-type farm should be capable of affording productive employment throughout a major portion of the year and of producing a minimum of about $1,500 gross income at long-term agricultural prices.

Operators' success on such units depends on their ability to obtain the best use of land, labor, and equipment. When this is accomplished, members of an energetic family can produce enough income from their own labor—with the exception of some additional hired labor at peak-load periods—to support a modest but adequate standard of living and to make a reasonable return on the investment.

This conclusion, backed by borrowers' records, means that the family-type farm has a definite place in the national economy and can be successfully operated. It disproves the theory sometimes advanced that a farm larger than one a single family can operate is necessary to earn a profit.

Other important factors in success are an adequate farm, a reasonable purchase price, a sound system of farming, and good methods. The attention borrowers give to soil conservation and livestock improvement, continuous upkeep of buildings, and careful money management is reflected in their records.

Farm Security also has made 324 farm-enlargement loans to families who were already owners when they sought assistance. These families, in many cases, were lacking enough good land to earn a livelihood, could not become permanently rehabilitated until they could round out their units into typical family farms. There is a greater need of this type of credit than can be met at present. Wartime changes have created new opportunities in some areas. Utah, for example, has had many farms which were too small to provide a living for their operators, but emigration from these sections now opens the way for those who remain to expand their units to economic size.

Farm-enlargement loans would help in the adjustment period when off-farm employment in war industry is curtailed. Many owners of inadequate units have been earning part of all of their living in industry. They cannot make a living from their land alone.

A similar need exists for farm-development loans. Depreciation of farm bulidings, because of wartime shortages of material and labor, has resulted in a serious need for postwar building improvements. Many families in the share-cropper sections of the Cotton Belt are living in definitely substandard homes, while in the West some of the families who settled on undeveloped farms during the migrations of the 1930's never have had a chance to complete their farm development, either in land or buildings. War food production has been retarded in certain areas because small farmers had no shelter for additional livestock. Families living on irrigation projects present an urgent need for farm-development loans.

Water in the West

The water-facilities program serves to round out Farm Security's rehabilitation and farm-ownership services in the West, where adequate water supply is probably the farmer's most important resource. More than 1,000 individual loans and 7 loans to farmers' groups were made last year, and engineering aid was given in the installation or repair of many types of facilities for farmstead and irrigation water. This program has served more than 11,000 western families since 1938.

Experience indicates that as much help can be extended low-income rural families through water facilities, per dollar spent, as through any other activity. With simple installations to supply water, labor is released for more productive work, and the farmer usually can make the maximum use of the available resources on the land he owns or rents.

Water must be put to its full use in the West if the small farmer is to survive. After the war the development and conservation of existing water supplies on which many thousands of small farmers depend will be comparable in importance to the settlement of newly reclaimed areas. Dams, pumps, headgates, irrigation ditches, and

other small facilities would stretch the resource base of small farms by enough margin to mean the difference between chronic poverty and a good living standard.

Group loans, made to farmers' associations, assist many more families than can be reached with individual loans totaling the same amount. In the last year, for example, in an Arizona community, a $35,000 loan and engineering assistance brought water from a mountain spring 6 miles distant to the homes of 133 farm families who urgently needed it. Since the settlement of their community in 1879 the people had depended on shallow wells which sometimes went dry and sometimes were flooded with contaminated ground water. The future of numerous small farming communities like this one is limited, unless adequate water supplies can be obtained; in some communities, public health will remain in constant jeopardy until clean water is provided.

Postwar planning committees have pointed to the serious need for more such developments for communities. A Nevada working committee listed 12 rural communities needing improvements in domestic water supplies, through development of new sources, treatment of present supplies, or installations of adequate storage and distribution facilities. County FSA supervisors have seen needs for similar community sanitation safeguards in 7 Arizona trading centers and 18 neighborhoods in Utah.

While the water-facilities program, under the Pope-Jones Act, is limited to the 17 Western States, similar aid would be useful to small farmers in some other areas. In the northeastern FSA region—Maine through Maryland—county supervisors report that loans would be of great value to small dairy farmers, for ditching, well drilling, farm ponds, and similar simple installations. Many rehabilitation borrowers in these areas do not have the water supply essential for dairying.

Health Services through FSA Programs

Efforts to help borrowers obtain medical care and improve health and sanitation were not relaxed despite the acute shortage of physicians and dentists in rural areas. While there has been a decrease in the number of local medical care associations through which borrower families receive general practitioner care and dental service by prepaying annual fees, there has been an increase in similar groups through which they obtain hospitalization and surgical care.

Consolidation of single-county medical care plans into multi-county units has gone forward in many places. Such multi-county groups, covering wider areas and with larger membership, have better financial support and receive a wider variety of services. Before the war there were only two State-wide health associations in operation for FSA borrowers—Vermont and New Jersey. Since 1943 three additional State plans have been developed—in North Carolina, Virginia, and West Virginia. They have been offering only surgical and hospital care, but arrangements recently were completed by the North Carolina association to provide general-practitioner care along with the other benefits.

Farm Security has urged borrowers to utilize all the resources of their communities that can help them with health problems. State and local health departments in several regions have developed close working relations with State, district, and county FSA workers, so that borrowers may benefit from programs for the control of tuberculosis, hookworm disease and malaria, immunizations for preventable diseases, maternal and child health clinics, school health programs, and similar services. Plans have been worked out in several States by which the correction of physical handicaps among borrower families is being accomplished through State vocational rehabilitation agencies without cost to the families. Health surveys among FSA families have provided valuable information for postwar health plans.

Farm Security in Puerto Rico

FSA continued an intensive attack on the problems of low-income Puerto Rican farmers. New rehabilitation loans for 2,159 families and farm-ownership loans for 50 families were approved in Puerto Rico and the Virgin Islands. There are nearly 11,000 families in the rehabilitation program in the islands, and about 600 in the tenant purchase program.

Health and sanitation problems must be solved, in most cases, as the first step in rehabilitation. The development of 22 projects supplying sources of pure water to several hundred families was a major accomplishment in this direction during the past year. Arrangements were made in one area for visiting nurses. Health service groups at Juncos and Humacao showed definite progress in teaching borrowers to utilize available services.

Rural rehabilitation in Puerto Rico is predominantly a program of guidance. Farming and homemaking problems are acute. Personal supervisory contacts are the most effective methods of helping families to overcome them. While credit is also essential, loans are small compared with those made on the continent.

Farm-ownership loans are establishing the precedent for a new pattern of agriculture and demonstrating a way of rural life that did not exist in Puerto Rico a few years ago. Most farms were well below the minimum standards for an economic unit, and the few large farms were far above the family-type enterprise. The program so far has been most successful. In the long run it will tend to intensify the present pressure on the land—a separate problem which has no ultimate solution in land tenure policy. The eventual solution will be a combination of education, industrialization, and emigration. The farm-purchase program does not create this problem—it merely makes it more evident. The tenant purchase farm is widely accepted on the island as the ideal arrangement for the small farmer.

CROP INSURANCE

The farmer is exposed to two kinds of risks of loss. One is the risk of crop failure; the other is the risk of declining prices. Both of these risks have been catastrophic at times. For over a decade the Federal Government has helped to absorb the farmer's price risk on many

commodities through commodity loans and other price-supporting programs. Crop insurance, for protection of the farmer against production risks, was first made available to wheat producers on the 1939 crop, and was extended to cotton producers on the 1942 crop.

Federal crop insurance was not available on the 1944 wheat and cotton crops or the 1945 winter wheat crop, because the 1944 and 1945 Agricultural Appropriation Acts provided funds only for liquidation of the insurance then outstanding. The Federal Crop Insurance Act was amended in late December 1944 to change certain of its provisions and to repeal the crop-insurance provisions of the 1944 and 1945 appropriation acts. Thus crop insurance is again available to wheat and cotton producers. It is also available for the first time to flax producers. Offered generally on a Nation-wide basis on these three crops, it had to be restricted to spring-planted crops in 1945, because fall crops had been planted before the legislation was amended.

The amendment to the Federal Crop Insurance Act authorized trial crop insurance on other commodities in a limited number of representative counties, but limited it in 1945 to corn and tobacco. Each year thereafter a trial crop insurance may be started on not more than three additional commodities. The purpose is to determine the most practical plans, terms, and condition of insurance for these commodities. Limited on each commodity to a period of 3 years and to 20 counties, the plan for trial insurance gives an opportunity to gain experience on a volume of business and a contingent liability kept at a low level.

Plans of Insurance

On all the commodities covered, the insurance is against losses due to unavoidable causes. On wheat, cotton, and flax the insurance is against loss of yield with coverage optional at either 75 percent or 50 percent of the long-time average yield for the farm. If the yield in the year of insurance is less than the coverage, the insured farmer is indemnified for the shortage. Under this plan, the amount of coverage, the premium, and the indemnity are determined in commodity units, such as bushels of wheat or pounds of cotton. Payment, however, both of premiums and of indemnities, is usually made in the cash equivalent at the current price.

The full purpose of trial insurance might not be accomplished if only one plan were offered. Consequently, two plans of trial insurance are offered on both corn and tobacco. One plan is against loss of the farmer's investment in his crop; it provides a coverage of 75 percent of the investment, with the coverage, the premiums, and the indemnities determined in dollars. If the returns from the crop are less than the coverage, the insured farmer is indemnified for the shortage. On corn, the second plan of insurance is against loss of yield, as in the plan used for wheat, cotton, and flax. The second plan for tobacco, however, insures the grower not only against loss of yield but also against loss of quality. Under this plan the amount of coverage is a dollar figure, determined at the end of the season by multiplying 75 percent of the farm's average yield by an average or representative price for tobacco in the year of insurance, with adjustments upward or downward to reflect the experience of the insured

for previous years in selling at prices above or below the market average. If the insured farmer's returns from his crop in the year of insurance are less than this figure, he is indemnified for the shortage.

Premiums

Generally, in these crop-insurance programs, a uniform premium rate per acre is being charged by commodities for all farms in a county. For example, such a rate might be 1½ bushels of wheat or 15 pounds of cotton, regardless of the amount of coverage for the farm. For investment insurance, in which the coverage is stated in dollars, the rate might be $5 per acre in a given county. The premiums established do not include any cost of administration; this cost is paid by the Federal Government. A capital fund is also provided by the Federal Government to absorb year-to-year fluctuations in losses.

Progressive Insurance Protection

The 1945 crop-insurance program for all the insurable commodities includes a plan whereby the amount of insurance protection increases with the progress of the crop. If an insured crop is destroyed or substantially destroyed early in the season but too late for replanting, and the acreage is released for other use, the protection given is approximately half what it would be if the crop were harvested. From that time forward, the protection increases with the progress of the crop. In previous years, when this provision was not in the program, losses to the Federal Crop Insurance Corporation have been heavy on abandoned acreage. On an average approximately one-sixth of the Nation's wheat acreage is abandoned annually. Although the abandonment of cotton acreage is a much smaller percentage, losses to the Corporation on such acreage have likewise been heavy because full losses have peen paid. Financial loss to the farmer is smaller on abandoned acreage than on acreage carried through to harvest; hence it has been frequently more profitable to the insured farmer to have a loss than to produce a crop, particularly when he has produced a substitute crop on the abandoned acreage. Progressive coverage provides protection on the principle that insurance should not provide an opportunity for extra profit but should simply give protection against loss.

Participation

Approximately 14,000 contracts are in force on 1945 spring-planted crops of wheat, cotton, and flax. They cover approximately 175,000 farms. Approximately 10,800 corn contracts are in force in 15 trial counties on more than 12,000 farms; and approximately 12,500 tobacco contracts in 13 counties on more than 12,000 farms. Most of the contracts on wheat, flax, and cotton provide for 75-percent coverage; most of the contracts on corn on which both yield insurance and investment insurance are offered, are for yield insurance. Those on tobacco, on which both yield-quality insurance and investment insurance are offered, are for yield-quality insurance. Preliminary reports

indicate that approximately 350,000 winter wheat farms will be covered by insurance for the 1946 winter wheat crop. Altogether, probably more than half a million farms will be covered by crop insurance in 1946. Wheat crop insurance contracts are on a 3-year basis; on other commodities the insurance is on an annual contract. Participation in the Federal crop-insurance program is voluntary.

Future Plans

In his message to Congress, Outline of Plans Made for the Reconversion Period, September 6, 1945 (H. Doc. 282, 79th Cong., 1st sess., p. 16), the President stated:

> The factory owner and the worker at the machine have available to them insurance programs which protect them from losses. Our farmers have the right to the same kind of protection. Strengthening and further development of crop insurance for farmers, organized and backed by the Federal Government, can give them this protection. A well-rounded crop-insurance program, together with the assurance of reasonable and stable farm prices, will go a long way toward meeting basic problems which have plagued farmers in the past.

EXTENSION PROGRAMS

In 1945 the Department had to help farmers maintain a high level of farm production and at the same time prepare for peace. This responsibility set new extension tasks. Extension work has been part of the Department's activity since 1914, when the Smith-Lever Act became law. This measure directs the Department and the land-grant colleges to agree on extension programs. Congress designated the Extension Service as the responsible national agency for intrastate recruitment and placement of emergency farm labor. In 1945 extension programs gave attention increasingly to postwar problems.

Congress passed the Bankhead-Flannagan Act to expand cooperative extension work, particularly in the counties. The measure authorizes a $12,500,000 increase in Federal funds over the next 3 years to be matched by State funds. Four and a half million dollars of the increase became available for the fiscal year 1946. An additional $4,000,000 is authorized to be appropriated for the fiscal year 1947 and an additional $4,000,000 for the fiscal year 1948. About 85 to 90 percent of the increase for the fiscal year 1946 will be used in the counties, much of it for strengthening 4–H Clubs, home demonstration, and Negro work. The new funds, together with an increase of $2,302,000 in State and local appropriations for extension work, will provide a total of $44,584,272 from all sources for the fiscal year 1946.

Practices recommended to farmers by the Extension Service contributed materially toward meeting crop goals and served also to promote Victory gardening. About 19 million Victory Gardens were planted in 1945.

The Extension Service helped farmers to construct or obtain storage for certain products; it provided technical guidance in the everyday requirements of farm production. As one example, extension pathologists furnished a potato blight warning service in the upper Mississippi Valley States, helped growers to get spraying programs under

way, located sources of necessary chemicals, and arranged for airplane dusting.

Among the livestock activities promoted by the Extension Service was a Nation-wide program for improving the balance between livestock numbers and feed supply. It included appropriate culling, selection of animals for quality, the stimulation of feed production, especially pasture and forage crops, and the practice of feeding balanced rations.

4–H Club Work

Boys and girls who had just passed into their teens at the time of Pearl Harbor shouldered heavy work and farm chores in the war years. In 1945 approximately 1,700,000 of them did so as members of the 4–H Clubs.

These clubs worked toward seven national 4–H war goals: (1) To help produce and conserve food; (2) to promote war-bond and other campaigns; (3) to guard their own and their community's health; (4) to work on the land themselves and to help city boys and girls in farm work; (5) to help interpret the Nation's war program to the community; (6) to learn a deeper appreciation of the democratic way of life; and (7) to discuss important social and economic forces and help to develop the Good Neighbor spirit at home and abroad.

Accomplishments of 4–H Club members since Pearl Harbor included: The growing of 1,000,000 acres of garden products and 1,300,000 acres of other food crops; the raising of 43,000,000 poultry birds and 2,700,000 head of livestock; the canning of 74,000,000 quarts of food and the preservation in other ways of a considerably greater quantity; the preparation of more than 50,000,000 nutritious meals; the collection of more than 400,000,000 pounds of scrap; and the purchase or sale to others of more than $200,000,000 worth of war bonds or stamps.

More than 50,000 4–H Clubs took part in educational programs in their neighborhoods. They improved school grounds, conducted local fairs, beautified roadsides, aided rural fire control, and conserved community resources. They learned and demonstrated methods in first aid, child care, home nursing, gardening, canning, meal preparation, care of farm machinery, farm and home safety, conservation, dairying, poultry and livestock raising. Club leaders planned postwar 4–H programs designed to prepare tomorrow's citizens for tackling tomorrow's programs. The items include: (1) Developing talents for greater usefulness, (2) joining with friends for work, fun, and fellowship, (3) learning to live in a changing world, (4) choosing a way to earn a living, (5) producing food and fiber for home and market, (6) creating better homes for better living, (7) conserving nature's resources for security and happiness, (8) building health for a strong America, (9) sharing responsibilities for community improvement, and (10) serving as citizens in maintaining world peace.

Cooperative extension work has stressed the need for an improved farm standard of living. Many plans for farm-home improvement had to be deferred in the war years. Extension programs helped farm families in 1944–45 to become accustomed to wartime living and to meet family needs while making less than the usual demand on

commercial sources of supply. Extension workers in rural areas helped in war-bond drives, Red Cross work, and scrap- and fat-salvage drives. Some 51,000 homemakers' clubs, with a total membership of 1½ million farm and rural women, cooperated closely in these wartime drives. Things learned in the war years should pay a peacetime return in the form of improved farm living.

Food Preservation and Nutrition

Food-preservation programs aided rural people to save and conserve food through home or community processing. Extension home demonstration leaders promoted nutrition education. Extension leaders and specialists worked with nutrition committees in analyzing nutrition in rural areas and pointing out urgent needs. Home demonstration workers carried on educational work to extend the enrichment of bread and flour. They visited local bakers, millers, and grocers, and urged that enriched white flour and bread be made available.

Postwar Education Programs

Two extension institutes were held during the year. The first dealt with postwar problems. Representatives of agriculture, labor, and industry and also representatives of the Land-Grant College Postwar Policy Committee took part. Materials presented at the institute from the Department of Agriculture and from State agencies became widely useful later in educational programs.

The second extension institute dealt with the State Department's educational program on building the peace. Subsequently, the State Department asked the Extension Service to encourage discussion of peace problems in rural areas. Federal and State extension workers developed a program for rural discussion forums. Such forums were conducted by 38 State extension services, with much use of materials presented at the institute.

A conference of State and district supervisors of extension work with Negroes was sponsored by the Department; it developed plans for the progress and advancement of agriculture among Negroes in the South. Among the problems considered were the role of extension teaching in the postwar cotton program; food production and conservation for home use; a program for farm youth; assistance for veterans and displaced war workers; a conversion program for the cotton South; rural health; and improvement in extension methods.

Veterans' Agricultural Guidance

The Extension Service began to develop and provide a counseling service for veterans and others who seek to establish themselves on the land. A system of county advisory committees was established in virtually every rural county throughout the country. The committees consist largely of successful farmers who know the local agriculture and are willing to counsel veterans and others. Other members include Government officials and local businessmen. The county agricultural agent organizes the local committee.

Farm Labor Service Continued

In 1945, for the third successive year, the Extension Service through its farm-labor program was an important factor in the attainment of high production of food and fiber.

More than 7,250,000 placements were made through this program in 1945; a million more than in 1944, the previous record. In addition, more than 750,000 persons who are not regularly engaged in agriculture did farm work as a result of educational activities. The Victory Farm Volunteers (youth) and the Women's Land Army continued to give effective service; recruitment of volunteer workers in each of these divisions was at the same level as in 1944.

Other highlights were the movement of 25,000 Latin Americans from Texas to sugar beet States under a cooperative program with beet companies; expansion of the wheat harvest combine program; building of the east-coast migratory-labor movement back to a total of 20,000 workers, as compared with 15,000 in 1944 and 7,500 in 1943; movement of more than 11,000 interstate workers at Government expense, from 6 States into 14 other States, for fruit, grain, and potato harvests and for haying.

FINDINGS OF EXPERIMENT STATIONS

Various acts of Congress provide for the support of agricultural experiment stations in the several States and in Alaska, Hawaii, and Puerto Rico. Among them are the Hatch, Adams, Purnell, and supplementary acts; also title 1 of the Bankhead-Jones Act of June 29, 1935. These measures foster research in agriculture, and in problems of the rural home and rural life. Administration of the laws involves Federal supervision of the funds granted, and brings the Department into close advisory relations with the experiment stations. In this capacity the Department is represented by the Office of Experiment Stations, which annually examines the work and expenditures of each station, and assists the stations in working out programs that will avoid duplication and provide needed integration. The Office administers the Federal Agricultural Experiment Station in Puerto Rico.

A discovery important to farmers and fishermen recently announced by Pennsylvania State College is a method for converting waste liquor from sulfite-process paper mills into a valuable soil improver. The 27 million tons of waste liquor annually poured into the streams of the country constitute a serious problem of pollution. This liquor contains a million and a half tons of lignin, a major constituent of the original wood used in manufacturing paper. When added to soils, this humus-forming material is precipitated by chemical and biological processes. Such material, with certain constituents harmful to crops removed, when added to freshly plowed ground will result in the formation of water-stable granules or clods which render the soil more permeable to air and water. This condition appears to be brought about by the lignin itself or by bacterial action induced by this and other constituents of the waste liquor, or by a combination of these factors.

Several of the State experiment stations have recently conducted research on the development and use of hybrid tomatoes. Results thus far show that certain hybrids may outyield the standard commercial variety in the area by 19 to 52 percent, with an average of 32 percent. Results at the Michigan station give an increase of 19 percent in one trial and 32 percent in another, at the Rhode Island station 52 percent, at the Tennessee station 26 percent, at the Minnesota station 32 percent, and at the Maine station 32 percent.

The national potato-breeding program, which was organized and aided by the Department in 1943, included 26 State experiment stations. In addition the Georgia and Louisiana stations participated in a special southern potato-breeding program. Progress was reported in the development of desirable strains with resistance to various diseases, often in combination. Among serious infections for which resistance is being incorporated in new potato varieties are late blight (*Phytophthora*), scab (*Actinomyces*), early blight (*Alternaria*), ring rot (*Corynebacterium*), fusarium wilt, wart disease (*Synchytrium*), and the virus diseases—spotted wilt, spindle tuber, aster yellows, and leaf roll, among others. In trials by the West Virginia station potato seedling B–247—named Potomac by the Maryland station and distributed to other cooperating stations and to growers—showed resistance to late blight and flea beetles and outyielded all other varieties tested. It was less subject to insects and diseases than Sequoia, and less susceptible to soil rots.

The Utah station has developed and released to farmers a new winter wheat—Wasatch—which is the most highly resistant of any commercially grown variety to cereal smuts and especially to the dwarf smut. Tests indicated that it is resistant to all but 2 of the 27 smut races, these 2 not being common in the Utah area. It is superior to the variety Relief, which is susceptible to smut, many fields in the land area having shown a reduction in yield of 85 to 90 percent from this cause. The new variety is derived from a cross between Relief and Ridit.

At the Lake Alfred Citrus Substation, following the severe freeze of February 1943 in Florida, further evidence was obtained that properly fertilized and sprayed citrus trees are better able to withstand adverse temperatures. Under conditions that removed all the fruit and leaves and some of the young wood from deficient trees, well-nourished and well-sprayed trees lost no wood or fruit and not over 5 percent of their leaves. Fruit injury was notably less in the well-nourished trees, partly because of the protecting foliage and greater subsequent recovery.

Light on the delicate relation between mineral nutrition and the susceptibility of crops to certain diseases appears in reports of the Virginia station. Evidence presented points to the probability that insufficient potash may render corn plants more susceptile to damage from bacterial wilt by reason of the resulting accumulation of nitrate in the water-conducting tubes of the corn stem. Deficiencies of other elements are thought to have a possible bearing on the disease reactions of various plants and on their reactions to parasites that invade the water-carrying elements in the wood.

A chemical test devised at the Colorado station makes possible the detection of peach mosaic virus in varieties that do not show symptoms but are carriers. Free-hand sections of roots and stems taken in the fall or early spring are treated with certain solutions which turn the wood of healthy trees pink to red while that of virus-infected trees remains white or yellow.

In a comparison by the Rhode Island station of seven spray materials on McIntosh and Baldwin apples with the standard lime-sulfur spray program, the lime-sulfur proved too injurious for use in Rhode Island. Though flotation sulfur and Fermate lessened the photosynthetic activity of the leaves, these chemicals were not as fully effective under epidemic conditions as two new and apparently noninjurious fungicides discovered by the station, viz, phenyl mercuri nitrilo triethanol lactate (Puratized N5X)—which gave almost perfect scab control—and lauryl isoquinolinium bromide (Isothan Q15). Both were able to kill scab infections already started, as well as to protect against new infection. Fermate proved somewhat more effective against scab than flotation sulfur. Although with an equal weight of hydrated lime added, it caused some "speckled" necrosis on Baldwin leaves, it did not do so on McIntosh. Fermate was deemed worthy of trial by orchardists because of its fungicidal value and because it reduced photosynthesis much less (except at high temperatures) than lime-sulfur. Lauryl pyridinium chloride (Q1) also appeared to have interesting possibilities for scab control, and with much greater safety than lime-sulfur.

In 1944 the Iowa station for a second year served as a clearinghouse for a potato late blight forecasting service established on a cooperative basis by the States in the upper Mississippi Valley. Evidence indicated that with weather conditions favorable to the disease, late blight might sweep destructively over the region if fields were not properly protected by spray. This resulted in a more consistent and extensive spraying program throughout the area which, together with a period of low rainfall during August, did much to hold the fungus in check. That the forecasting service prompted more general spraying of potatoes was shown by complete exhaustion of quotas of sprayers and spray materials in potato areas and by the purchase of vegetable sprayers from other States. Climatic conditions favorable to the disease and those that prevent it from developing seriously may alternate in a narrow balance, the survey showed.

Experiments in livestock feeding yielded significant results at several experiment stations:

In a 175-day test at the Iowa station, yearling steers fed a daily ration of silage, 1 pound of alfalfa hay, 1.5 pounds of soybean meal, and simple minerals and salt—with corn added only for the last 40 days on feed—gained 344 pounds per head and produced 781 pounds of beef per acre of land required to grow the silage, corn, and hay. Cattle full-fed corn, with alfalfa hay for roughage, although they gained 411 pounds per head, produced only 489 pounds of beef per acre. In other words, 0.44 of an acre grew the silage, corn, and hay for a silage-fed steer against 0.84 of an acre required to grow the corn and hay for the steer full-fed on corn and alfalfa.

Digestion experiments and feedlot trials with fattening steers at the Ohio station indicated that ground corncobs are approximately 63 percent as valuable as the corn grain for fattening steers. The fattening trials compared ground shelled corn, regular corn-and-cob meal, and double amounts of cob in corn and cob meal, each full-fed with a protein-mineral supplement and mixed hay.

The South Carolina station found that steers fed a ration of cottonseed meal and hulls—in comparison with those fed shelled corn and alfalfa or lespedeza hay—made slightly faster gains and required less concentrates per 100 pounds of gain, but the roughage requirements were considerably lower for the steers on corn and hay. Relative costs made the feeding of cottonseed meal and hulls more profitable in each of the tests. Meat studies by members of the Department staff at Beltsville showed that beef from the steers fed cottonseed meal and hulls was as tender, palatable, and desirable as that from steers on corn and hay.

Results from a study at the Oklahoma station indicated that ground wheat can be safely fed as a complete substitute for corn if mixed with silage or cottonseed hulls. Ground wheat proved to have 107 percent the value of ground shelled No. 2 corn when mixed with silage and 102 percent when mixed with cottonseed hulls; shelled corn is, however, the more palatable. This research establishes a practical way for substituting ground wheat for all of the corn in a calf-fattening ration.

Experiments during 3 years at the Maryland station showed that cheat (*Bromus secalinus*) when fed as 30 percent of the grain ration is equal to barley for milking cows. In field experiments, cheat outyielded oats and under many conditions barley also.

In an attempt to find uses for the waste leaves that occur in producing and processing vegetable crops, the Eastern Regional Research Laboratory made up five leaf meals which were fed to chicks at the Delaware station. These meals were incorporated into chick mashes and constituted 8 percent thereof. Chicks fed on these mixtures were compared to similar chicks fed on alfalfa leaf meal. Those receiving broccoli meal made the fastest growth. Carrot, lima bean, and turnip meals were about equal to alfalfa, and pea-vine meal gave a little slower growth. The flavor of the meat of all broilers fed on the vegetable leaf meals was good; that of the birds fed on broccoli leaf meal was the best and was unusually fine.

A home-mixed calf starter ration developed by the New Mexico station has proved capable of developing dairy calves at an approximately normal rate. The ingredients, which are generally available in the area, consist of ground threshed kafir, wheat bran, cottonseed meal, alfalfa leaf meal, dried brewers' yeast, and minerals. Calves given a good start on whole milk to about 1 month of age, then fed only the calf starter ration plus high-quality alfalfa hay for the next 3 months, and fed a simple grain mixture with good-quality hay thereafter, were approximately normal in size at 6 months of age. This program resulted in a marked saving of milk as compared to the conventional method of raising calves.

Colostrum produced in excess of calf needs on large dairy farms can be frozen and preserved all winter at little cost in the northern United States and used for calf feeding in place of marketable milk, which can then be sold for human consumption. That calves will thrive on a diet with colostrum entirely replacing milk even up to 63 days after birth was indicated by tests at the Vermont station; all calves grew satisfactorily.

The Wisconsin station has demonstrated cobalt deficiency in dairy cattle in the northeastern part of the State. Afflicted animals show poor appetites, reduced milk production, and lowered hemoglobin levels in the blood. Feeding cobalt sulfate at the rate of 1 ounce to 100 pounds of common salt gave spectacular results on the affected farms; the hemoglobin rose slowly, appetite and milk production were restored, and a generally bettered physiology brought about. Although polycythemia can be produced in rats by too much cobalt, 50 mg. of this mineral per day—20 times the amount used in practice—has not induced this excessive production of red corpuscles in the blood of heifers. Similar findings were reported earlier by the Michigan station as applying to various areas in that State.

Further trials by the Missouri station to determine the optimum level of administering synthetic thyroprotein to dairy cows gave evidence that a dosage of 1–1.5 grams daily per 100 pounds body weight of a preparation standardized to 3 percent thyroxine content gives an increase of about 10 percent in milk production and 15 to 25 percent in butterfat, which could be maintained over an extended period.

The feeding of a ration of cull beans and alfalfa to ewes during gestation and lactation resulted in a high percentage of offspring affected with stiff-lamb disease, in experiments by the New York (Cornell) station. Administration of two doses weekly of 9 ml. per ewe of an 8.25-percent solution of mixed tocopherols in cottonseed oil starting 24 days before the first lamb was born prevented the occurrence of this disorder in any of the lambs. Furthermore, lambs from ewes on the unsupplemented diet, when treated with 2 ml. of an olive oil solution of 140 mg. alpha-tocopherol acetate, were protected against the disease. Subcutaneous injection of an aqueous solution of an alpha-tocopherol compound also proved efficient for treating affected lambs.

A method of concentrating citrus juices perfected by the Florida station gives a product as nearly like fresh juice as has yet been accomplished. The concentration is carried out by freezing to a slush consistency, followed by centrifuging to complete the separation; the product is then frozen in blocks or briquettes in convenient sizes and held in a frozen state. Earlier attempts to market frozen juices commercially had not been successful because of the problem of distributing the large quantities necessary and the difficulty of melting quickly for serving. The juice is now concentrated to such strength that it can be reconstituted by adding enough water to melt it. After 20 months' storage the prepared frozen juice still retains 90 percent of its vitamin C content and has not changed in color.

Through use of a process developed by the Pennsylvania station a new frozen concentrated milk may be manufactured in any dairy plant equipped with an evaporator, homogenizer, and ice-cream freezer. The process is the same as evaporation for canning, followed by freezing to a mushy consistency in the ice-cream freezer, and further freezing in a storage room at 10 degrees below zero after packaging. For best results the frozen milk must be held at low temperatures. Properly processed, the concentrate can be reconstituted into a product hardly distinguishable by the average consumer from fresh milk. It is defrosted and diluted to fluid consistency by putting the frozen block directly into hot water. By using an equal amount of water, a product resembling coffee cream or cereal cream is produced. By adding twice as much water, milk for beverage or general purposes is produced. As formerly manufactured, frozen milk resulted in an oily product when thawed.

Work of the New Jersey station, a pioneer in studies of antibiotic substances produced by micro-organisms, has brought forth evidence that the production of penicillin is not confined to any one species of fungus or even to the mold genus, *Penicillium*, and that the conditions favoring maximum yields differ with the species or strains involved, most of which also produce a second antibiotic factor. Furthermore, this station has isolated and described six other antibiotic substances produced from the soil, viz, actinomycin, clavacin, fumigacin, streptothricin, streptomycin, and chaetomin. Of these, the two showing the most promise are streptothricin and streptomycin.

In tests of penicillin by the Arizona station against plant pathogenic bacteria, crown galls induced by bacterial inoculation were destroyed by wrapping antiseptic cotton soaked in crude penicillin around them after puncturing them in numerous places with a sterile needle. The method is suggested for trial on nursery stock and set trees and on other plants with galls limited to aerial parts.

A sulfa drug—*p*-aminobenzenesulfanilamide—completely controlled the virus X-disease of peach when injected into seedling trees in the greenhouse 2 weeks after the trees had been artificially inoculated with the causal virus, according to experiments by the Connecticut (New Haven) station. Trees treated in 1943 are still healthy and those treated in 1944 had no signs of the disease 4 months after injection. When treatment was given before inoculation with the virus, only 70-to-80-percent control was effected. The drug unfortunately caused some injury to the trees, but use of 2 percent maltose or dextrose with the sulfa compound antidoted the injurious effect to a large extent without in any way decreasing the effect of the drug on the X-disease. *P*-aminobenzoic acid, when added to the sulfanilamide, was found to antidote its beneficial effect and had no effect on the virus; physicians have also found that *p*-aminobenzoic acid antidotes the bactericidal and fungicidal properties of *p*-aminobenzenesulfanilamide when used in treating human patients. Though this work is still in the experimental stage, the discovery opens up the field of control of virus diseases of plants by chemotherapy and may lead to the common application of this method in the future.

ENTOMOLOGY DURING THE WAR YEARS

Wartime condiions and demands brought about many changes in entomological research and the related pest control and regulatory activities. Emphasis was placed on developing new and improved materials and methods for combating disease-carrying insects, on perfecting methods of applying insecticides and fumigants, and on finding insecticides for use as substitutes for those containing critical war materals. Manpower shortages, and in some instances shortages of necessary materials and equipment, necessitated modification of some eradication and control activities to the point of merely holding ground previously attained. Convoys, secrecy as to the time and ports of arrival of vessels, and greatly increased air transport, brought about tremendous problems, and required changes in plant quarantine activities.

Entomology during the war has made unusually rapid progress in certain technical fields, beyond what would have been possible under peacetime conditions. Many of its technical advances have been utilized by the Army and Navy, and on the home front. Some of them promise to have almost revolutionary effects.

Control of Disease-Carrying Pests

The most striking advances are in the field of medical entomology. Much of this work has been carried on under a transfer of funds, recommended by the Committee on Medical Research, from the Office of Scientific Research and Development to the Bureau of Entomology and Plant Quarantine.

Shortly after Pearl Harbor the Surgeon General's Office of the Army requested the Bureau of Entomology and Plant Quarantine to conduct studies on the fumigation of clothing and personal equipment because of the need for a more efficient method than steam sterilization for freeing servicemen from all stages of body lice, the carrier of typhus. Within a few months specialists in the Bureau of Entomology and Plant Quarantine demonstrated that all stages of body lice could be killed by relatively short exposure to methyl bromide gas, at any temperature. Practical methods of mthyl bromide fumigation were developed and have been in use by the armed forces since 1943. These include individual fumigation bags for treating one soldier's outfit and demountable fumigation vaults for use in the field and at debarkation ports.

Soon after the United States entered the war, the Office of the Surgeon General of the Army wanted a simple, rapid, and effective method of killing mosquitoes and other insects in closed spaces, such as the cabins of airplanes, barracks and tents. Bureau scientists had previously discovered the aerosol method whereby an insecticide, dissolved in a liquefied gas held under pressure in a container, upon being suddenly released, will suspend tiny droplets of the insecticide in the air in the form of a fog. Suitable formulas for aerosols containing pyrethrum were soon developed and proved highly effective for controlling flies and mosquitoes, without being toxic to man. In cooperation with the Surgeon General's Office and manufacturers, the

bureau developed suitable metal containers or "aerosol bombs" for holding and dispersing the materials. By 1944 more than 16 million of these had been made for the armed forces for use against malaria mosquitoes and other disease-carrying insects.

Funds to facilitate work to develop methods of insect control for the benefit of the military forces were made available to the Department by the Office of Scientific Research and Development, so that research of special importance to the military could be carried forward without unduly handicapping the Department's work on more strictly agricultural problems. MYL louse powder, containing pyrethrum, was recommended early in the war for control of lice attacking man. One treatment remained effective for about a week. By the middle of May 1943 a louse powder containing 10 percent of the insecticide known as DDT was recommended. This is easily applied by dusting inside the clothing and one treatment gives control of lice for about 3 weeks if the clothing is not washed. Within a year it had been widely used to free troops and civilians in North Africa and Italy from lice and proved its worth in controlling a typhus epidemic in the Naples area. Practical methods for the treatment of underwear with DDT in solution have also been developed which give protection against lice through six to eight washings. Incidentally, the DDT impregnation also mothproofs the garments.

DDT insecticides were found to be effective with one treatment against both adult mosquitoes and the larvae or "wigglers" that breed in swamps and other stagnant waters. As a result of work conducted by the bureau, larvicidal dusts and sprays containing DDT were recommended to the military forces by July 1943. The formulas and dosages worked out have been widely used to protect troops from malaria in the various combat areas and are being applied by the Public Health Service in extensive malaria control campaigns in the South, especially around training camps. In proper mixtures extremely low dosages of DDT are effective against mosquito larvae. Special equipment was designed for the distribution of larvicidal sprays by airplane, the most efficient method of applying DDT over large areas for control of mosquito larvae. In experimental work conducted with the Army and Navy, excellent control of adult mosquitoes in jungle or other areas of dense foliages was obtained with DDT sprays applied by aircraft. In the control of adult mosquitoes the long residual effect of DDT is its most important characteristic. Practical field tests have shown surfaces in houses treated with this material to remain effective in killing mosquitoes for longer than 2 months.

Early in 1942 it was found that dimethyl phthalate was more effective than any other known material for preventing bites of the malaria mosquito, *Anopheles quadrimaculatus*. This repellent, emulsified and properly applied to the outer garments, also gave protection against chiggers for almost a month. As a result of further work a single repellent consisting of a mixture of dimethyl phthalate, butyl mesityl oxide oxalate, and 2-ethyl hexanediol was developed and made available to the armed forces for effective protection against a variety of biting insects that cause discomfort or transmit deadly diseases.

The Bureau of Entomology and Plant Quarantine has also aided service personnel in recognizing disease-carrying insects and in becoming familiar with the most recently developed methods, materials, and equipment for their control. Occupation by the armed forces of many new areas has intensified the need for exact identification of mosquitoes and other possible disease-carrying pests present in those areas. Many thousands of such specimens, especially from the Pacific Islands, have been identified. Numerous officers of the Army and Navy have been given first-hand instruction in insect identification by Bureau specialists. Further helpful assistance has been given through the preparation of identification keys for use in the field. Service personnel charged with the protection of troops from disease-carrying insects must be kept informed of the newest materials and methods for use in the field. To aid in providing this information, latest developments in the control of insects injurious to health are discussed in training conferences held each month at the Orlando, Fla., laboratory. Since October 1943 more than 1,000 officers of the Army, Navy, and Public Health Service, as well as authorized civilians, have attended these conferences.

As an even more direct contribution, approximately 150 trained entomologists of the Bureau of Entomology and Plant Quarantine have entered the Army, Navy, or Public Health Service. Many have been assigned to the control of malaria mosquitoes and other disease-carrying pests.

War-Created Insecticide Shortages

Early in the war it became apparent that demands by the armed forces for certain insecticides and for critical materials used in the production of others would seriously interfere with the requirements of materials needed for insect control on the home front. The situation was further aggravated when the usual sources of pyrethrum and rotenone were largely cut off. The Bureau of Entomology and Plant Quarantine took an active part in the compilation of statistics on the manufacture and ultimate use of these and other scarce insecticidal materials and advised the War Production Board and other interested agencies on methods for their conservation.

Extenders were developed to make existing supplies of scarce materials go further. For example, it was found that sesame oil when used with pyrethrum greatly increases the effectiveness of the latter, and makes possible the control of insects with smaller dosages. A number of synthetic compounds were found to produce a similar effect with pyrethrum.

Steps were taken to make certain that short supplies of insecticides might be used most advantageously to help maintain production of essential food and fibers. In cooperation with State agencies, the Bureau of Entomology and Plant Quarantine has conducted extensive week-by-week war-emergency insect-pest surveys. These surveys give special attention to insects that require the largest amounts of highly critical insecticides for protection of important food and fiber crops. Among them are the Mexican bean beetle, the potato leafhopper, cabbage caterpillars, the cabbage aphid, the pea aphid, which affects

vegetable crops, and the boll weevil, the bollworm, and the cotton flea hopper. Information as to the occurrence and abundance of the insects and as to local insecticide situations, is made available promptly.

New Control Equipment and Methods

Manpower shortages and the need under emergency conditions for rapid application of insecticides to large areas have stimulated the development of new equipment and methods for applying insecticidal materials. One significant development is the utilization of the airplane to apply insecticidal sprays in highly concentrated dosages. Because of the weight of the considerable amount of water or carrier required for spray formulae previously in use, adequate pay loads could not be handled by planes efficiently. Now, by distributing highly concentrated sprays through equipment that breaks them up into small atomized particles, it is possible to thoroughly treat large areas of vegetation in one pay load. Several types of equipment have been developed and are now in use for this purpose.

A portable device which is readily attached to any plane has made possible mosquito control with the application of as little as 2 quarts per acre of liquid containing DDT. A spinner disk type of distributor and one using a nozzle giving a fine spray have been used extensively on planes in experiments with DDT sprays against insect pests of forests. These tests have indicated that the gypsy moth, the green-striped maple worm, the redheaded pine sawfly, and the spruce budworm can be controlled with dosages as low as 2.5 pounds of DDT in 2.5 gallons of solvent per acre and that even lower dosages may be used effectively. These low dosages make it possible to treat large acreages of woodland with one load of insecticide. This development is expected to make practicable for the first time the protection from defoliating insects of vast areas of valuable timberland.

Improved equipment, developed in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering, for mixing and distributing poisoned bait, has been used extensively in the control of grasshoppers and Mormon crickets. Other developments of importance that increase work efficiency and at the same time conserve manpower include the expanded use of insect traps for survey work. Since 1942, traps employing a sex attractant prepared from female gypsy moths have been used more extensively than ever before to locate the presence of male moths. This has made possible the scouting of several million more acres of woodland to determine the presence of this important forest-stripping pest than could otherwise have been accomplished. Similarly, the development of a sticky-board trap to capture pear psylla adults proved a valuable aid in determining the presence of that important fruit pest in the Pacific Northwest, where measures are being taken to prevent its spread into the main commercial pear-producing areas.

The possibility of adapting insecticidal aerosols for use against various agricultural pests and the value of aerosols produced by means of heat rather than by liquified gas have also been under investigation.

DDT Extensively Tested

In addition to the continued research to discover other new materials of insecticidal value, extensive investigations have been carried on since early in 1943 to determine the usefulness of DDT for the control of pests injurious to agriculture. In cooperation with various State agricultural experiment stations, this chemical has now been tested against more than 170 different kinds of insects, including those of importance to the health of man. The results show that it kills many kinds of insects and has promise for use against a number of agricultural pests. Among those against which it is especially toxic are the codling moth, Japanese beetle, cabbage looper, velvetbean caterpillar, vetch bruchid, white-fringed beetles, cotton bollworm, pink bollworm, horn flies on cattle, gypsy moth, and spruce budworm.

It is not, however, a panacea for all insect problems. It has been found to have little or no effect in tests against a number of important crop and livestock pests, including the boll weevil, cotton aphid, cotton leafworm, Mexican bean beetle, orchard mites, red spider, sugarcane aphid, sugarcane borer, and cattle grub. DDT insecticides have been found to kill honeybees and other pollinating insects necessary for the fertilization of many fruits and seed crops. They are also harmful to beneficial parasites and predators that help hold many injurious pests in check. In some instances an injurious effect on plants and on fish and wildlife has been observed. Little is known about the effect on plants of accumulations of residues in the soil. Continued experiments are being carried on as rapidly as facilities permit. These will help to produce practical spray and dust formulas containing DDT for use against various pests and to determine how these new insecticides may be used safely and efficiently on the farm and in the home.

War Brought New Pest Risks

Disruption of normal traffic, both from abroad and within the country, due to military requirements and the exigencies of war, created many serious quarantine problems.

Greatly increased ship arrivals and the convoy system placed heavy loads on inspection staffs during peak periods. The use of dry ballast containing topsoil, the discharge of cargoes at ports where they are not ordinarily permitted, and similar problems necessitated modification of existing procedures and the adoption of emergency measures. All such changes made in quarantine activities were aimed toward continuing maximum security against the possibility of pest escape while at the same time causing the least possible interference with the war effort. The abolition of the convoy system in the Atlantic and the cooperation of the armed forces is helping materially to meet problems connected with the return of troops from Europe.

A major plant-quarantine problem has been the tremendous expansion of air-borne commerce during the war years. In the fiscal year 1945 there were inspected 45,728 airplanes arriving after only a few hours journey from many different foreign countries. This was more than six times the number of planes inspected during the fiscal year 1941 and is more than double the number inspected in 1944. Prohib-

ited plant material was found in nearly 16 percent of the planes inspected. The rapid progress made in air transport and the speed with which a plant pest can be transported by this means emphasizes the seriousness of the risks involved in the possible introduction of new pests through air commerce.

The arrival of greatly increased quantities of parcel post packages from abroad also developed a perplexing plant quarantine problem. Over 3 million packages from overseas were examined in 1945, an increase of about 2,000 percent over those examined in 1944. Most of these were sent by American men and women in uniform, who enjoy customs and postal privileges that place their mail in a class apart from regular foreign mail during peacetime. Thus, this problem will continue as long as the armed forces remain overseas.

Wartime Stimulus to Entomology

The pressure of wartime demands made it necessary to retard temporarily some of the fundamental research on which the knowledge of insect-pest control depends. War conditions have also made possible prompt large-scale tests of insecticides and insecticide distributing devices. At the same time, the necessity for promptly meeting emergency problems in the control of disease-carrying pests, in the control of agricultural pests, and with regard to plant quarantines, has pointed out the places where further basic research is most urgently needed.

Conditions brought on by the war have in some instances caused a retardation of work under way toward the eradication or control of certain important insect pests and plant diseases. Efforts have been made, however, to keep the progress previously achieved. Many of the wartime developments, including DDT insecticides, new and improved equipment for distributing baits and other insecticidal materials, and more efficient traps and methods for conducting insect pest surveys will result in more effective control measures. It may be possible actually to eradicate some of the pests that now require large sums for control purposes.

RESEARCH IN DAIRY PROBLEMS

The Bureau of Dairy Industry was established by Congress in 1924 to promote the economic welfare of the dairy industry by developing practical and scientific information and disseminating the results. It has been following that kind of a program now for a little more than 20 years, including the war years.

Its general objectives did not change with the coming of the war, because all its activities had always been pointed toward the development of better dairy herds and more efficient milk production, better methods of handling and processing milk and utilizing the byproducts of dairy manufacturing processes, and improvement in the quality, palatability, and wholesomeness of dairy products. Its 20 years of research and the training and experience of its personnel did, however, enable it to help the various branches of the dairy industry and the

Government alike in planning wartime programs and in solving numerous specific dairy problems.

Dairy Cattle Feeding Research

With the beginning of the European war, before the United States became actively engaged in it, the demand for milk and milk products increased greatly. Because of the time required to produce a dairy cow and the uncertainty as to how long the increased demand could be expected to last, the dairy industry was urged to produce the needed increase, largely with the facilities on hand. Since feeds in general were plentiful and of good quality, and grain was relatively low in price compared with butterfat, farmers were advised to feed more grain than they had been in the habit of feeding, especially in summer.

Farmers frequently underfed grain because they had no way of telling how much could be fed at a profit. The advice to feed more grain was based on the results of a 3-year feeding experiment that had just been completed by the Bureau of Dairy Industry, in cooperation with 10 State agricultural experiment stations. The results of that study showed how much grain could be fed, at different price relationships for milk and grain, to get the highest milk production that would be profitable. Since economy in milk production is always desirable, dairy farmers will find this information just as helpful from now on as it was during the war.

Later in the war period, when farmers found it difficult to get high-protein concentrates, grain byproducts, and other ingredients which they believed were necessary for making a desirable dairy mixture, the Bureau was able to advise them that cows would produce practically as much milk on a single-grain ration, such as corn, barley, or kafir, as they would on a mixture of several grains and high-protein concentrates, provided always that the cows were fed plenty of good-quality legume hay or silage with the single grain to furnish the protein. This information was the result of feeding experiments over a 3-year period that had just been completed at the Bureau's several field experiment stations.

Prior to the war many dairy investigators, including the Bureau's specialists, had shown the economic and nutritional importance of an abundance of high-quality roughage for milk cows. As a result, dairy farmers were cutting their hay crops at early stages of maturity to improve the protein content. When they could not make good hay they put the crops in the silo, using molasses and various acids to preserve the silage.

But the war created a shortage of molasses and the acids became very costly. In the meantime, however, the Bureau had proved that, with proper attention to the moisture content of the crop and complete exhaustion of the air from the silage, no preservative would be needed with any crop. A simple, inexpensive moisture tester was devised to help farmers determine when the crop had wilted to the right stage for making good silage. Thousands of farmers, having tried the Bureau's so-called wilting method through necessity, are now using it through choice.

Because of the short supplies of protein feeds during the war, the Bureau of Dairy Industry conducted feeding experiments with synthetic urea as a possible means of furnishing additional protein for milk production. Urea contains no protein itself but it does contain nitrogen, and research by other investigators had shown that the cow can combine the urea nitrogen with other feed constituents to make protein in her body. The Bureau's feeding experiments showed that high-protein feed, such as soybean meal, could be replaced with an equal weight of low-protein feed plus one-seventh as much urea without affecting milk production materially one way or the other.

Sufficient urea did not become available to permit its general use in dairy rations during the war, but the information does indicate that urea may have a prominent place on dairy farms under certain conditions. Its greatest usefulness on dairy farms perhaps will be on those where plenty of grain is grown but where there is need for additional protein and where this need can be supplied with urea more cheaply than with oilseed meals.

Breeding Better Dairy Cattle

Because of its years of research directed toward the breeding of high-producing strains of dairy cattle at Beltsville and at its various field experiment stations, the Bureau of Dairy Industry was able to make a sizable and direct contribution to the farmers' efforts to increase wartime milk production. Prior to the war years these experimental herds had become a reservoir of "superior germ plasm," as was indicated by the increased milk production in numerous farm herds where the Bureau's experimentally bred bulls had been loaned for service and to be proved. On the average the daughters of these bulls had produced 1,000 pounds more milk per cow per year than their dams. To date more than 1,000 bulls have been loaded and proved in cooperators' herds.

Some of the outstanding bulls thus discovered were then loaned for service in cooperative breeding associations and in artificial breeding organizations, where their superior breeding inheritance was spread over a large number of dairy herds. One proved bull, bred at Beltsville and proved in a farmer cooperator's herd, was loaned to the New York State Breeders' Cooperative and in the following 3-year period "artificially sired" some 3,000 calves. Some 300 Bureau-bred bulls are now on loan in individual farmer's herds, institutional herds, cooperative bull associations, and artificial breeding organizations.

The Bureau's experimental breeding herds, in which an inheritance for uniform high levels of production is being established by the continuous use of good proved sires, will continue to serve as a demonstration of a successful breeding procedure for commercial breeders, and at the same time provide a reservoir of good "blood" for the improvement of the Nation's future dairy cattle.

Dairy-herd-improvement associations in every State are one of the principal mediums through which research information on the feeding, breeding, and management of dairy cattle is being introduced into general practice. These associations, organized by groups of pro-

gressive farmers primarily to obtain records of production, feed cost, and income on the individual cows in their respective herds, are sponsored by the State dairy extension services and the Bureau of Dairy Industry. Under the direction of these agencies, the testing and record-keeping is conducted on a uniform basis in all associations.

The association records not only serve the members directly, but indirectly they also afford nonmembers an impressive demonstration of the value of following approved dairy practices. In addition, the records are filed by the Bureau for study and analysis, with a view to locating outstanding animals and encouraging their owners to perpetuate their breeding for the good of the dairy industry as a whole.

The herds enrolled in the dairy-herd-improvement-association program are an important source of desirable breeding stock for use in the Nation-wide effort of Federal and State extension workers to improve the dairy cattle outside the association herds. As a part of the improvement program, the Bureau of Dairy Industry each year tabulates the dam-and-daughter production records for several thousand bulls that have been used in the association herds. The ultimate object of the sire-proving program is to single out the superior sires and their sons for more intensive service in other herds through the medium either of cooperative bull associations or of artificial-breeding organizations.

Since the beginning of the sire-proving program, 15,000 association sires have been proved. The daughters of these sires, for which production records were available, averaged 381 pounds of butterfat per cow per year. Since the average butterfat production for the 26 million cows milked in the United States last year was only 182 pounds, it seems obvious that practically all of these proved bulls and their sons could be used for the benefit of the dairy industry by placing them in herds in which their proved-sire records indicate they would be able to increase production.

The number of proved sires will continue to increase as more production records are obtained from the association herds and filed for future tabulation. To date the Bureau has filed the identification records of more than 2 million association animals, both cows and bulls. Production records have been recorded for about 800,000 cows, and dam-and-daughter data are accumulating on some 90,000 bulls that have been used in the association herds and that are listed in the Bureau's files.

Dairy-Products Research

Throughout the war years the Bureau of Dairy Industry was called on for information, advice, and assistance with numerous technical problems in the dairy-products field. This service covered a wide range of activity, such as making chemical and bacteriological tests of dried milks to determine their keeping quality; making moisture-proof tests of different containers that were being considered for use in packaging dried milk in bulk and in consumer-size lots; preparing samples of evaporated milk for special studies; compressing dried milks, soups, and vegetables in tablet form, and sweetened condensed milk into block or bar form, for studies of their possible use in emer-

gency rations; determining the value of new antioxidants; analyzing samples of Cheddar cheese; and cooperating in studies of the drying, packaging, and storing meats.

A few years previous to the war the Bureau had developed improved procedures for making Cheddar cheese of uniformly good quality. Pasteurization of the milk was an important new part of the method. When the war brought a demand for increased production of Cheddar cheese, Bureau specialists went from factory to factory to introduce the new method, because the Government wanted only the U. S. No. 1 grade for overseas shipment. Many factories that had been turning out less than 35 percent of No. 1 cheese were able to increase the proportion to 80 percent, and more, by following the procedures demonstrated by the Bureau specialists.

Laws have now been passed in several States requiring that all cheese sold be made from pasteurized milk, or that it be cured for a definite period of time before being sold. This is to reduce the possibility of disease-producing organisms being present in the cheese. During the past year the Bureau devised a practical method for testing Cheddar cheese to determine whether it was made from pasteurized milk or not.

Vitamin A in Butter

Since 1941 the Bureau of Dairy Industry has been cooperating with some 20 State agricultural experiment station laboratories to determine (1) the average vitamin A potency of the creamery butter produced in the United States; (2) the effect of commercial methods of storage on the vitamin A potency; and (3) the vitamin A potency of the butter sold on the retail markets.

The results of the Nation-wide survey, which were compiled by the Bureau during the year, show that about 64 percent of the creamery butter is produced in summer and about 36 percent in winter. The summer butter has averaged nearly 18,000 International Units of vitamin A per pound and the winter butter about 11,000, making the average potency of the total annual output approximately 15,000 International Units per pound.

The survey showed also there is practically no loss of potency during ordinary commercial storage and handling of the butter, and that butter sold on the retail markets also averaged about 15,000 international units of vitamin A per pound. Butter of the average potency, when consumed at the prewar rate of 18 pounds per capita per year, furnishes about 15 percent of the daily vitamin A allowance for normal adults.

Butter containing as much as 23,000 international units is frequently produced in summer, under very good pasture conditions, but there are large fluctuations in the vitamin A potency of the butter produced from month to month and from State to State. The difference in vitamin A potency is largely the result of differences in the carotene content of the roughage feeds available to the cows in different seasons and regions. Research by the Bureau of Dairy Industry and by other investigators has shown that it is possible, by proper feeding, to produce butter in winter with the same high vitamin A potency as the summer butter. Research workers are now turning their attention to

the development of methods which will be sufficiently practical and economical to enable more farmers to feed their cows as well in winter as in summer.

Penicillin as a Preserving Agent

Experiments by the Bureau of Dairy Industry during the past fiscal year have opened up a new field of possible usefulness for penicillin through its destructive action against bacterial spores. It is believed that the drug may be effective as a preserving agent in certain commercial fields, including food preservation, paper manufacture, and processes associated with the tanning, wool, and rubber industries. Bacterial spores, a dormant resistant form of germ life, occur widely in nature, causing deterioration and spoilage of some industrial materials and occasionally fatal poisoning in canned foods. They are a major problem in the commercial canning of nonacid foods.

Earlier work of the Bureau had shown that mild heating started the growth of many species of spores. Since penicillin is most effective against nonspores when they are actively multiplying, it was thought that it might also act against spores when they are stimulated to start growth. By incubating spores in a fluid containing small amounts of penicillin it was found that, after beginning to germinate, the spores become sufficiently unstable to be attacked by the drug, which results in the destruction of a high percentage of them.

The effectiveness of penicillin in destroying bacterial spores, together with its nontoxic nature and its rapidly increasing availability, suggests its possible use as a food-preserving agent. The Bureau of Dairy Industry is especially interested in the possibilities for sterilizing evaporated milk and preserving fresh milk for longer periods.

RESEARCH AIDS LIVESTOCK PRODUCTION

As the war has progressed, the dependence of the livestock industry on research to solve changing problems has become increasingly apparent. Improved methods of cattle management in the Great Plains have helped to produce greater wartime tonnages of beef. In the southern part of the area are vast acreages of sagebrush land and much abandoned cropland that has become less productive because of erosion.

Experiments by several Department and State agencies have demonstrated that mowing the sagebrush improves yields of range grasses and other desirable forage. In about a year this practice almost doubled beef production per acre. The studies showed also that overgrazing reduces the vigor and growth of grass long before the effects become apparent in reduced cattle gains. Experiments with abandoned cropland have demonstrated that it can be put back into a productive state for grazing beef cattle rather quickly by seeding it to grass mixtures adapted to the region.

Correcting Mineral Deficiencies Increases Beef Production

Another way to step up beef production in some range areas is to feed phosphorus supplements to breeding cattle. Especially in the

Gulf coast region much of the vegetation available for grazing is deficient in this mineral. Correcting the deficiency results in more and better calves. Early results of cooperative investigations in southern Texas showed that feeding bonemeal and disodium phosphate to cattle, by hand dosing, was beneficial in two ways. It prevented the onset of phosphorus deficiency and, in animals already affected, corrected it if not too far advanced. A supplement containing 6.5 grams of phosphorus per head daily has been adequate for the purpose. Feeding twice this amount to lactating cows produced no additional benefits. The studies showed, also, several other satisfactory ways of giving the phosphorus. Bonemeal may be fed in self-feeders. A mixture of 90 percent, by weight, of disodium phosphate and 10 percent of cottonseed meal may be supplied in the same way. The phosphorus can also be given effectively in the form of disodium phosphate dissolved in the drinking water. Or cattle can be supplied with phosphorus by fertilizing the vegetation with a triple superphosphate.

Control of Vitamin A Deficiency

Observations of beef cattle in feed lots and after slaughter have shown that vitamin A deficiency is an important nutritional disease of fattening cattle. Experiments have confirmed this view. Prominent symptoms are: Night blindness progressing to total blindness; a rough dry coat; stiffness or lameness; convulsions; swelling of the legs, hind quarters, brisket, and shoulders; and rapid breathing, especially during hot weather. As a result cattle lose weight and condition near the end of a long feeding period. Those severely affected sometimes die or, if slaughtered, yield carcasses unsuitable for food. Stockmen can prevent this deficiency by providing a liberal supply of green forage, well-cured hay, or silage, in addition to the usual fattening ration of cereal grains, corn, grain byproducts, and protein concentrate. Yellow corn, even in abundance, cannot be depended upon to prevent vitamin A deficiency.

Distillery and Sweetpotato Products as Cattle Feeds

Cooperative experiments begun in 1943 on the feeding of distillery slops to steers show that the use of this feed is practical for increasing beef production, especially in areas adjacent to distilleries. Several hundred thousand cattle are being fed distillery byproducts annually; this has resulted in a material increase in beef production.

Sweetpotato meal, the product resulting from the dehydration of sweetpotatoes, is proving to be satisfactory for fattening cattle in the Southeast, where yields of 200 bushels per acre can easily be produced and where other carbohydrate feeds suitable for beef cattle are limited. Tests by Department and State investigators show that sweetpotato meal compares favorably with corn when each is combined with a sixth of its weight of cottonseed meal. A mixture of equal parts of sweetpotato meal and cracked shelled corn appears to be about as efficient as corn alone.

Improved Strains of Swine

Investigations aimed at the improvement of swine through different systems of breeding have resulted in several outstanding inbred strains of hogs. Some are from crosses of the Danish Landrace with breeds of American and English origin. These strains are superior to the parent stock in several respects and are also more uniform in their inheritance than most purebreds. The general results indicate that good inbred strains of swine should be as beneficial to the swine industry as inbred lines of corn have been in establishing highly productive hybrid seed corn.

Modified Wartime Swine Rations

Early in the war the demand for tankage and fishmeal, commonly used as a source of protein in swine rations, far exceeded the supply. Results of previous research indicated that the shortage of these animal-protein feeds could be met by using larger quantities of vegetable-protein feeds, such as soybean or alfalfa meal. Supporting this belief, feeding trials with sows and growing pigs showed that rations containing adequate supplies of protein feeds of plant origin were fairly satisfactory although not quite so good as those containing animal protein. To make the best use of limited supplies of animal-protein feeds for swine, stockmen should use them for young growing pigs up to 75 pounds in weight, and for sows during the gestation and suckling periods. The rations of fattening hogs may be made up entirely of feeds of plant origin.

Brooders Reduce Pig Losses

How to reduce losses of young pigs during the suckling period has been a problem long confronting the swine industry. Tests by the Department show the value of electric pig brooders for this purpose. Such a brooder can be built in the corner of a pen at moderate cost. A 150- to 200-watt electric-light bulb, installed in a frame about a foot off the floor, supplies mild heat during cold and damp weather and gives the young pig a better start in life. The light also attracts the pigs so that they remain away from the sow much of the time, thus reducing the opportunity for her to crush or otherwise injure them.

Poultry Feathers for War Uses

When, early in the war, it appeared that supplies of waterfowl feathers and down would be insufficient for military demands for these materials, Department scientists sought to develop substitutes. They succeeded in producing two useful feather products from waste chicken and turkey feathers. One, called feather fiber, is a soft, light, downlike material that resembles waterfowl down in appearance and general properties. The scientists produced it by grinding cleaned chicken or turkey feathers and then removing the quill particles by blowing the ground feathers through a specially designed series of towers. The heavier quill particles drop out but the light,

fluffy feather particles cling together and are finally collected as feather fiber. The other product, called fractionated feathers, consists simply of the softest and choicest of the feathers separated from the coarser feathers by a similar system of separation by air. Both these products have excellent insulating properties and are suitable for many manufactured articles requiring warmth and lightness. The new feather products have given good results in tests, when used alone or combined with down and other fibers.

Dehydrated Meat Successfully Produced

Because of the critical shipping situation early in the war, an urgent need developed for preparing meat in a form that would save both space and weight. Dehydration was a promising solution to the problem, but there was little information on the preparation of meat in this form. Accordingly, four bureaus of the Department's Agricultural Research Administration, cooperating with several outside agencies, undertook to devise methods for producing dehydrated meat of acceptable palatability and of good keeping quality and nutritive value. This study contributed to large-scale production of dehydrated meat, mainly pork, which facilitated the feeding of the allied armed forces overseas.

In all, eight methods of dehydration, embodying mechanical features that had proved successful with other products, were tested. The vacuum rotary process appeared to combine the most good points. Meat prepared by this method had good palatability, keeping quality, and other desirable characteristics. However, other processes excelled in certain respects—for example, rate of drying, continuity of operation, and palatability of freshly dehydrated products. Dehydration was found to reduce the weight of the original boned, trimmed, fresh meat by approximately 60 to 70 percent. The reduction in volume, when the dehydrated meat is properly compressed, is about 65 to 73 percent.

Better Eggs from Better Poultry

Chickens that produce eggs of superior quality are among the products of research by the Department's poultry scientists. Some lines of chickens lay eggs having a larger percentage of thick white than usual, so that the eggs poach and fry better. Other lines have thicker, less porous, and stronger eggshells. One line lays eggs almost entirely free from blood spots. The scientists have bred some birds whose infertile eggs maintain good table quality for 2 weeks at 100° F., whereas most eggs are practically unfit for such use after 1 week at that temperature. All these improvements have resulted from applying principles of breeding and selection that are readily within the reach of progressive poultrymen.

Anticipating shipments of hatching eggs by airplane from the United States to Europe and other areas for replenishing poultry flocks depleted by the war, Department scientists studied the effect of reduced atmospheric pressure on the hatchability of chicken eggs. The tests were carried out in a laboratory, under conditions similar

to those likely to prevail in air transport. Reduced atmospheric pressures corresponding to altitudes of at least 78,000 feet proved to have no effect on subsequent hatchability at moderate altitudes. The experimental results were later confirmed by several shipments of chicken and turkey eggs.

Eradication of Bovine Tuberculosis

Results of official tuberculin testing of cattle during the year disclosed a slight increase in the percentage of reactors, further demonstrating the importance of follow-up work in the eradication program. The increase was from 0.2 percent in 1944 to 0.24 in 1945. During the fiscal year 1943 it was 0.18. These percentages, however, are very low compared with the former extent of the disease, which in some areas affected 20 percent or more of the cattle.

Valuable aid in the program is rendered by meat inspection services, both Federal and State. Through the reports of veterinarians conducting post-mortem examinations of cattle, it has been possible to locate and remove tuberculous cattle from centers of infection that might otherwise have escaped detection for a considerable length of time.

Suppressing Brucellosis

The demand for Federal and State assistance in the eradication of bovine brucellosis, or Bang's disease, continues. In this work the area plan consists in testing all dairy and breeding cattle more than 6 months of age, removing the reactors, and cleaning and disinfecting the premises. Thus far the Department has designated about 600 counties, located in 22 States, as modified accredited Bang's disease-free areas, indicating that not more than 1 percent of the cattle of the herds were found to be infected. Since the adoption, on January 1, 1941, of calfhood vaccination as a part of the official plan of eradicating brucellosis, approximately 1,260,000 calves have been vaccinated under official supervision, nearly one-half of them during the last year. In addition, a greater number probably were vaccinated privately last year, since about 2,000,000 doses of vaccine, prepared under official supervision, were made available for that purpose.

Heretofore the Department has advocated the protective vaccine for use in calves only. But field trials have now shown definitely that in some types of herds and under certain conditions, vaccination of adult cattle in an infected herd tends to prevent abortion and curb the spread of the infection. Vaccination is not recommended in herds entirely free from brucellosis, in cows 5 months or more advanced in pregnancy, or when prohibited by State laws.

At the end of the year, more than 17,500,000 cattle, located in about 2,300,000 herds, were under supervision for the eradication of brucellosis. An additional million cattle were on the waiting list.

Vesicular Diseases Identified

Two vesicular diseases of animals, vesicular stomatitis and vesicular exanthema, have been identified in this country. Their symptoms are similar in many respects to those of the dreaded foot-and-mouth disease, which has not been present in this country for many years.

Several investigations were made, during the year, of outbreaks of vesicular diseases in animals. Through laboratory techniques, these diseases were definitely shown to be vesicular stomatitis and not foot-and-mouth disease.

To familiarize State livestock officials, veterinarians, and others with the symptoms of the vesicular diseases and their correct diagnosis, the Department prepared and distributed a motion picture giving detailed information on this important subject.

Penicillin Useful in Controlling Mastitis

During the year small quantities of penicillin became available for research in bovine mastitis. Preliminary results indicate that the drug is effective by udder infusion in a majority of cases caused by streptococci and staphylococci and that it is less irritating to the bovine udder than other chemical agents now in use. Penicillin is not effective, however, against certain other types of mastitis infection, nor can it be expected to be other than an aid to required sanitary procedures in the control of mastitis.

Hexachlorethane Expels Liver Flukes from Cattle

Another development in veterinary science, resulting from Department research, is a practical means of controlling cattle liver flukes. These are small, leaflike parasites that inhabit the gall ducts of the liver. They produce unthriftiness and seriously affect the health of infested animals. Treatment is based on the discovery that the chemical, hexachlorethane, when combined with a claylike substance known as bentonite, can be suspended in water. The suspension is easily administered with a dose syringe and is highly effective in removing the parasites from cattle, which are not harmed by the treatment.

Although this discovery was first announced only about 2½ years ago, the drug has been in commercial production for nearly 2 years. The suspension, as well as the crude drug, is being marketed and used successfully in several States where liver flukes are a serious drain on cattle production.

Hog Cholera Well Controlled

Immunization of large numbers of pigs, combined with sanitary safeguards, appears to have been effective in preventing extensive outbreaks of hog cholera. A noteworthy element in hog cholera control is the continued administration by the Department of the marketing agreement made between the Secretary of Agriculture and handlers of anti-hog-cholera serum and hog cholera virus. The order that established this agreement has been in effect about 9 years and has helped assure livestock raisers of an adequate supply of serum and virus at all times for combating hog cholera.

Other diseases of swine have also been fairly well controlled in the country as a whole. Consequently the health of hogs, thus far during the war period, has been remarkably good, especially in view of the larger numbers of hogs on farms and the consequent greater opportunity for infections to spread.

Sodium Fluoride Effective in Removing Swine Roundworms

One of the most practical discoveries made during the year is the effectiveness of sodium fluoride, a well-known and cheap chemical, for removing large intestinal roundworms, or ascarids, from pigs. These parasites make the animals unthrifty and produce serious injury t othe liver and lungs. Sodium fluoride is well known to be a poison; yet, when mixed with the regular mash in the proportion of 1 part of the chemical, by weight, to 99 parts of mash, it was well tolerated by pigs. It removed more than nine-tenths of their ascarids, a rate much higher than those obtained with other drugs commonly used for the purpose.

Skim Milk and Whey Prevent Parasites in Swine

Department parasitologists discovered also that skim milk and whey—dairy products that are abundant in normal times—protect pigs effectively against large roundworms, nodular worms, and whipworms. One method of feeding is to give a liberal quantity of skim milk or whey once a day and other feed as usual. This practice is continued for an indefinite period. Another method is to provide the skim milk or whey as the exclusive feed for 3 days in succession, at intervals of about 2 weeks. When either plan is followed, the parasites named either are not acquired at all or are acquired in such small numbers as to cause practically no injury. Moreover, the pigs make satisfactory gains in weight and are in excellent condition throughout the feeding period.

Phenothiazine—a Boon to Sheep Production

The value of the synthetic drug, phenothiazine, for removing parasites from livestock was first demonstrated by Department parasitologists several years before the war, but the most important developments in its use, especially for sheep and goats, are of recent occurrence. One finding is the effectiveness of a mixture of phenothiazine and salt, in the ratio of 1 part of the drug to 9 parts of loose granular salt, for the control of sheep parasites. This method of treatment was first tested by Department parasitologists. Other scientists later confirmed its value.

Use of this treatment by sheepmen has given such good results that free access of sheep and lambs to the mixture, especially during the grazing season, has already become standard practice in nearly all sheep-producing areas of the country. If sheep are given a full therapeutic dose of phenothiazine before they are put on pasture and are later allowed free access to the medicated salt throughout the grazing season, infestations with stomach worms and nodular worms—two major enemies of sheep—are kept low. Infestations with other injurious parasites are also well controlled by the same treatment.

FORESTS AND THE WAR

When hostilities ended in Europe and the Nation's war effort was concentrated against the Japanese, the need for lumber and pulp-

wood mounted. Packaging, boxing, and crating vast quantities of military supplies and equipment for shipment to the Pacific, and establishment of bases and facilities in the newly won areas, called for an even greater volume of forest products than in 1944.

Essential military and civilian requirements for lumber in 1945 were estimated at 40 billion board feet; the goal for domestic production of pulpwood was 16 million cords. With wartime labor shortages and other difficulties, production was below needs. Even after the Japanese surrender, forest-products needs continued heavy.

The 1920–40 average of annual lumber consumption was slightly under 30 billion board feet. It is likely that annual demand will be above this figure for several years after the war. Wood requirements for pulp and paper are also expected to remain at high levels, materially exceeding prewar consumption rates. But will prospective demands for forest products outstrip the supply?

The latest estimates of the rate of timber growth in the forests of the United States were made in 1938. At that time the total annual growth was estimated at 11.3 billion cubic feet. Losses from fire, insects, diseases, etc., reduced this to a net usable increment of 9.2 billion cubic feet, including both merchantable material and small timber. The volume of logs and cordwood cut for all purposes was estimated at 11.4 billion cubic feet. Timber cut thus exceeded net usable increment by 2.2 billion cubic feet.

In trees large enough to yield sawlogs, the net usable increment was 26.7 billion board feet; the volume cut was 42.4 billion board feet—more than 50 percent in excess of growth.

To bring these figures up to date and to obtain additional information that will show us just where we stand today, the Forest Service this year began a reappraisal of the forest situation in the United States. The reappraisal project calls for a review of existing data, on-the-ground checks, and careful analyses to determine the amount of timber now standing in our forests, the current rates of growth and drain, the condition of forest lands, and how they are being managed. It will provide this and other up-to-date knowledge necessary to the intelligent planning and acomplishment of forestry programs.

Although up-to-date figures may be lacking, there can be no question of the fact that we are taking timber from our forests faster than it is being replaced by new growth. Because of continued depletion of growing stocks, the annual net increment is not likely to have changed much since 1938, but the drain is now substantially larger. Annual lumber cut in the past few years has been some 30 percent greater than it was in 1938. Too much forest land is still being stripped of its timber and left incapable of further production for years to come. We cannot continue to eat into our forest capital and reduce the productive capacity of our forest land without serious consequences.

Growth the Important Thing

The United States has a lot of forest land—630 million acres, approximately one-third of the continental land area. Of this, 462 million is capable of growing timber of commercial quality or quantity, and is available for such use. If this forest land were kept reason-

ably productive, it could easily produce all the timber we are likely to need and a surplus for export to other countries. But its productivity must be built up and maintained. The most important consideration right now, therefore, is what is growing on this land. In order that the supply of wood may be continued from year to year without interruption, a growing stock of timber must be established and maintained so that the volume cut is constantly being replaced by an equivalent volume reaching merchantable size, in places where it can be utilized economically.

We must see to it, therefore, that our depleted forests are restored to productivity and that all forest lands, regardless of ownerships, are kept permanently in productive condition.

A big job of forest restoration and improvement faces us now that the war has ended. Millions of idle acres need planting; many areas of struggling young growth need thinning or other improvement work to increase the quantity and quality of timber yield; watershed areas that contribute to flood danger need special treatment. Such work will aid in meeting postwar problems of employment. It is work that should be done in any event as an investment in the future of America. It will build up a resource basis for new industries and permanent jobs.

Along with this work that looks to growing more timber, we shall need to take action to stop the downward trend of our existing forest resource. The Department of Agriculture repeats its recommendation for Nation-wide regulation of timber cutting and allied forest practices sufficient to prevent the use of destructive cutting methods and to make sure that cut-over lands will be left in reasonably productive condition. Such regulation may be carried out by the individual States, under basic standards set up by national legislation, and with Federal aid in financing the program. But the Federal Government should take direct action if the States fail to do so.

To help those forest owners who are practicing destructive cutting make the transition to continuous production, and to encourage private owners to undertake real sustained yield management, the Department has recommended increased public aid to forest owners. Expansion of cooperative fire protection, help in combating destructive forest insects and diseases, increased technical aid in forest management and marketing of forest products, public assistance in the establishment of cooperative forest-management and marketing associations of small woodland owners, provision for long-term, low-interest credit to forest owners to facilitate sustained-yield management and encourage rehabilitation of run-down forests—these are measures which will help to encourage private enterprise in timber growing.

Some forest lands have been so denuded that they offer no prospect of income for decades. Some lie in such rough or inaccessible country or are so low in productivity that there is little likelihood that private enterprise will undertake timber growing on them. Such lands would best be in public ownership, managed and protected as Federal, State, and community forests. For certain other areas where there are acute problems of watershed protection or other needs vitally affecting the

welfare of dependent communities, public ownership is also the logical answer.

Right now is not too soon to begin building up our growing stock of timber. It is doubtful, indeed, whether right now is soon enough. It will take many years to bridge the gap between cut and growth, to say nothing about developing full potential output of our forests. And it is more than likely that before the gap is bridged we shall have to get along for a spell with less lumber and other timber products.

Timber and Foreign Trade

We cannot count on large-scale imports to augment our supply of lumber. Few countries of the world have surplus saw timber. Russia has extensive forests but its own demand for forest products is increasing. The well-managed forests of Sweden and Finland produce exportable surpluses, but they have big markets close at hand. Net imports of sawn lumber and timber from Canada averaged about 500 million board feet for several years before the war, but in Canada, like the United States, timber supply is dwindling and demands from the home market and for export are increasing. Postwar exploitation of Latin American forest resources may make available larger quantities of tropical hardwood timber but the type of material obtained will be suitable mainly for cabinet woods and other specialty uses rather than for construction lumber. The great Parana pine forests of Brazil may provide an increasing volume of softwood lumber, but expanding home markets may absorb much of it.

It would be poor economy, in any event, to place our future dependence for timber on foreign sources when we have a vast acreage of forest land capable of growing our own, most of which land would be of little value for other purposes.

The United States, on the other hand, may be called upon for a large volume of timber for reconstruction and development in Europe and Asia. Cutting enough timber to meet our own needs in the immediate postwar years, however, will continue to eat into our forest capital. Any large-scale exportation of timber, therefore, will further jeopardize our own future supplies.

The United States has not been and probably will not soon be self-sufficient in pulp and paper. Before the war, more than half of the paper and paperboard consumed in this country was made from wood grown in other countries. With a probable large postwar demand for pulp and paper in Europe, the Scandinavian countries may not send us as much as they did before, and there is some question whether Canada will materially increase her exports of pulpwood, pulp, and paper to the United States. So any substantial increase in our pulp and paper consumption will necessitate either effective utilization of much material now wasted or increased cutting in our own forests; and if the increased cutting is to be more than a temporary matter, we shall have to grow more pulp timber.

The forests of our Southern States could be managed to yield much larger supplies of pulpwood than they do now. Large increase in pulp- and paper-plant capacity in the South, however, will hardly be justified until there is assurance of continuous, adequate supplies of

wood. There are possibilities for expansion of pulp and paper output in the Pacific Northwest through utilization of waste material and neglected species. There is opportunity also for development of a pulp and paper industry in southeastern Alaska. Managed soundly, the timber supply in the national forests of Alaska could insure a perpetual yearly yield of 1¼ million cords.

New Uses for Forest Products

Growing scarcity of timber may force some use of substitute materials. But wood is so versatile and has so long been the choice material for many things that use of other materials would meet some resistance at least. For some uses—railroad ties, for example—no satisfactory substitute has yet been found. There can be little question of the ability of wood to hold its own in competition with other materials, so long as it can be supplied in adequate quantity at reasonable cost.

Recent technological advances in wood utilization, indeed, point to an increasing demand for wood. The Forest Products Laboratory, maintained by the Forest Service at Madison, Wis., has accomplished some striking results in increasing the value and usefulness of forest products. Laminated wood, improved plywoods, and wood- and paper-base plastics are finding an increasing variety of uses. Such Laboratory products as "impreg," "compreg," "papreg," "staypak," and the "uralloys" are receiving growing recognition in the industrial field. We now have the technical information upon which to base an industry for the production of industrial alcohol from wood waste on a scale sufficient to meet any conceivable demands; and the first commercial plant, the engineering plans for which are based on the results of the Laboratory's fundamental and pilot-plant investigations, is expected to be in operation at Springfield, Oreg., before the end of 1945. The importance of wood in the war brought the Forest Products Laboratory into the forefront of technical war agencies. The staff was greatly enlarged and its work directed wholly to war problems. Many new products and processes, developed to meet urgent war needs, when directed to tools and goods of peace, hold promise of creating new industries and providing increased employment.

The possibilities for chemical conversion of wood have scarcely been scratched. Wood sugar, from which industrial alcohol can be derived, can also be converted to other products, as for example, high-protein feed for livestock. In present chemical conversion processes, roughly 50 percent of the wood is lost as waste, of which about one-half is lignin and the remainder hemicellulose. A small percentage of the enormous lignin residues from pulping processes is now being used, but finding profitable uses for the remainder continues to be one of the most important waste problems. Research has indicated the possibilities of converting hemicellulose into such products as adhesives, butanol, acetone, ethanol, and many others. Further exploration and development is needed to determine the technical and economic validity of such conversion and the resulting products.

From felling in the forest, through the various steps of manufacture to the finished lumber product, it is estimated that about two-thirds of the wood volume in the average tree is wasted. Huge vol-

umes of wood in the form of treetops, broken trunks, cull logs, and inferior species are left in the forest because it costs more to collect it and move it to market than it can be sold for. Improvements that will reduce the cost of logging, assembling, and transporting the material, and that will bring neglected species into use, must be effected if this potential supply of raw material is to find its way into commercial channels. Too often forest industries develop around a single product, such as lumber, veneer, or wood pulp. The harvesting is confined to certain species, sizes, and quality, and the remainder is unused or wasted. There is need for development of diversified manufacture, so that in a given locality the species and grades that make up the forest will be used for various products. Utilization also should be complete so that the waste or byproduct of one plant becomes the raw material of another. More complete utilization of the forest crop can help in some measure to close the gap between annual growth and drain.

The Forest Service in 1945 established two regional units, each consisting of a small corps of technical experts in forest products utilization. Working in close cooperation with the Forest Products Laboratory, these men bring the findings of that institution to industry, assist in commercial application of new discoveries, study local problems, transmit to the Laboratory problems that require special investigation or advice, and do whatever else they can locally to promote improved forest utilization. Five additional regional forest-utilization units are to be established this year.

National Forest Timber and Range

Volume of timber cut from the national forests in fiscal year 1945 was 3,144,800,000 board feet, valued at $13,119,580. The total cut was slightly below that for 1944, when 3,333,000,000 feet were harvested—an all-time high. Practically all of the timber cut went to essential wartime uses.

As the pressing need for aircraft spruce slackened, the Forest Service terminated operations of its Alaska spruce log program, begun in 1943. During the life of the project, 38,346,136 board feet of high-grade spruce logs from the Tongass National Forest in Alaska were delivered to Puget Sound mills. In addition, approximately 46 million feet of lower grade material were supplied to Alaska sawmills for the urgent construction needs of the armed forces in the Territory.

Availability of national forest stumpage has made it possible for many mills and logging operations to remain in production when without this stumpage they would have been forced to close or substantially curtail output for lack of raw materials. As long as urgent war-induced demand continues, national forest stumpage will be made available to the extent feasible to keep such mills and logging operations going. Under the Forest Service's sustained-yield policy it will continue to be made available after the war to help maintain permanent forest industries and the communities dependent upon them.

National forest ranges are helping and will continue to help meet our needs for meat, wool, and leather. During 1944, permits were

issued to 34,000 owners to graze 1,316,800 cattle, 4,287,900 sheep, and 7,100 swine. In view of the pressure for greater meat production, special efforts have been required to hold livestock numbers as closely as possible to grazing capacity—to avoid repetition of the disastrous results of overstocking permitted during World War I in the vain hope of increasing the meat supply. Emphasis has been placed during the present emergency on improved-management and livestock-husbandry practices. Thus, with better animals on full feed under effective management, the national forest ranges are able to make their maximum contribution toward production goals consistent with the permanent productivity of the range.

In the long run, the grazing capacity of the national forest ranges can be greatly increased, but in the meantime further adjustments in grazing use will be necessary to protect watersheds and restore depleted range. Methods for range reseeding developed through Forest Service research are proving a practical means of re-establishing desirable forage growth. On a 500-acre area reseeded in 1942 in the Fishlake National Forest, Utah, at a cost of $3.22 per acre, grazing capacity was increased from 8 cattle for 4 months to 100 cattle for 4 months. Increase in value of beef produced in the first year of full utilization (1945) will be greater than the investment in reseeding ($2,300 vs. $1,610). The Forest Service is developing plans for an extensive range-reseeding program in those regions where sound methods already have been worked out, and for continued research in regions where further experimental work is needed.

Cooperative Farm Forestry Projects

Technical service in the management of farm woodlands and marketing of woodland products is meeting with growing interest on the part of farmers. To June 30, 1945, 100 forest-farming and farm-woodland marketing projects had been established by the Forest Service, involving 403 counties, an average of about 4 counties per project. The projects are maintained in cooperation with the States, on a 50–50 basis. Forty additional farm-forestry projects were transferred from Soil Conservation Service to the Forest Service at the beginning of the fiscal year 1946.

In each project, the services of a forester are available to woodland owners to work up management plans for their timber tracts, to assist in marking and measuring timber ready for harvesting, to obtain competitive bids for the timber, and prepare simple sale agreements which will protect the interests of both the farmer and the purchaser. This type of assistance is resulting in the farmer's receiving more for the timber sold than he would have realized under the old lump-sum sale practice, and what is even more important, he is left with a stand of thrifty trees which will produce future crops. The program is becoming popular with mill operators as well as with farmers, since purchase of marked trees of known volume reduces the element of risk in the farmer's operations and since the selection method of cutting furnishes the millman with larger, better quality logs, and gives him the opportunity for return cuts and assurance of continuity and stability of operation.

There are approximately 139,000,000 acres of farm woodlands in the United States capable of growing commercial timber. Farm forests occupy about 18 percent of all land in farms; in the South and Northeast, from 40 to 60 percent. Present estimates indicate that about one-third of all our annual timber cut comes from farms. The importance of the farm output of forest products is increasing as virgin-timber supplies dwindle. In general, however, farm woodlands are producing from one-third to one-half what they could under improved forestry practices.

Farm timber growing should be attractive for the future. While problems of surplus production may again arise for certain other crops, a prospective period of timber scarcity should serve to maintain a demand for products from farm woodlands.

Timber growing has special significance in the solution of the cotton-adjustment problem in the South. With present cotton acreage too large, adjustment of output is essential; and in the adjustment the small cotton grower on hilly land may be unable to compete with large-scale mechanized production on the level areas. Other uses must be found for the South's labor and land. Forestry is one solution. Timber takes its place with livestock, forage crops, and grains in a well-balanced farm economy in the Southern States.

Timber Production War Project

To help facilitate a greater output of lumber, pulpwood, and other forest products urgently needed for war purposes, the Forest Service continued its timber production war project during the fiscal year 1945. The project was carried on at the request of the War Production Board. It operated in the area east of the Great Plains where thousands of sawmills had previously been idle or operating only part time. State forestry departments, Extension foresters, and other agencies of the Department of Agriculture cooperated with the Forest Service in the program.

To help meet problems of manpower, educational efforts to discourage absenteeism were made with woods and mill crews. Approximately 25,000 prisoners of war have been trained for woods work by project foresters. Millwrights and other specialists were found to assist operators with their equipment and to encourage increased use of power saws and other labor-saving tools. Procurement of new equipment and repair parts was expedited. Supplies of timber for the mills have been located, and woodland owners have been furnished advice on stumpage values and markets. Reports indicate that operators have taken advantage of and appreciated this service. One of the chief byproducts of the project has been to acquaint landowners and mill operators with the value of getting assistance of trained foresters on their production problems.

Getting under way in September 1943, the project by June 1, 1945, had contributed to the production of more than 6 million board feet of forest products. This covered only cases where results could be translated into specific quantity estimates. It was believed to represent only 60 to 70 percent of actual accomplishments in sustaining production.

Emergency Rubber Project

The emergency rubber project, authorized by the Congress in 1942, continued under the policies and program authorized by the 1945 Agricultural Appropriation Act. The Forest Service, which had been assigned general direction of the project, maintained the 31,356 acres of guayule plantations already established, constructed a new rubber mill at Bakersfield, Calif., continued operation of the Salinas mill, and started the processing of rubber from shrub harvested from the first project plantings. A start was made on the liquidation of the project nurseries, the seedlings to be processed for rubber, the equipment and improvements removed, and the land returned to the owners.

Cooperation with guayule producers in Mexico was accelerated both on operations and agronomic research. A further sale of about 20 million seedlings was made to the Continental-Mexican Rubber Co., which has started a planting program expected to reach 15,000 to 20,000 acres. Results of Forest Service experience with guayule milling techniques were made available to the Mexican Government. A sale of approximately 20,000 pounds of guayule seed was made to Argentina.

The Department has now entered into an agreement with the Rubber Reserve Company looking to the milling out as rapidly as possible of all guayule shrub from plantations established under the project, to help meet continuing needs for natural rubber. Acting as agent for the Rubber Reserve Company, the Firestone Tire & Rubber Co. will construct four new mills and operate them, together with the mill already constructed at Bakersfield. The mill at Salinas will continue to be operated by the Department as a pilot plant to prove out certain processing improvements developed by the Department's research.

Other Wartime Contributions of Forestry

The Forest Service was asked to send a trained staff of experts to Europe to conduct training courses for officers and men of the Army Services of Supply charged with the packaging of vast quantities of war supplies for transhipment from the European to the Pacific war theater. Four packaging specialists from the Forest Products Laboratory were sent to France to operate the packaging school. The school continued until the end of July, and more than 1,200 men were put through the course. During August the laboratory specialists gave consulting advice at various out-packing centers in the European theater before returning to the United States.

A total of 13,839 representatives of the Army, Navy, and industry have attended packaging courses conducted by the Forest Products Laboratory specialists since 1942. An additional 1,358 persons have been given instruction in aircraft wood inspection and related courses.

The Forest Service has participated actively in an organization to gather information on technical and industrial developments which occurred in Germany during the war years. This information was desired both to aid the United States in the prosecution of the war and to assist American industry in the postwar period.

Fortieth Anniversary of Forest Service

The Forest Service was 40 years old in 1945. It was established on February 1, 1905, when the earlier Bureau of Forestry was reorganized and the forest reserves (later renamed national forests) that had been set aside from the unreserved public domain were placed under its jurisdiction. Governmental forest work actually began in the Department of Agriculture as far back as 1876, with the appointment of a special agent to study forest conditions in the United States. In 1881 a Division of Forestry was set up in the Department, and in 1901 this became the Bureau of Forestry. Through these earlier periods, however, the Department's forestry work amounted to little more than compiling information and offering advice.

In the past 40 years the Forest Service has made a significant record of achievement. It spearheaded the whole conservation movement in the United States. The national forests under its jurisdiction have become the world's outstanding public forest system. It has developed sound forestry techniques applicable to American conditions. Where the practice of forestry has been adopted by timberland owners, it is very often directly or indirectly the result of pioneering work of the Department's foresters.

But the biggest jobs remain ahead. The downward trend of our forest resource has yet to be reversed. The bulk of our private forest lands are still handled with little regard for future productivity. Large areas of depleted land need to be restored to usefulness. On its fortieth anniversary, the Forest Service pledged itself to renewed effort in a program of forest improvement and development that will make the forests play their full part in serving the welfare of the Nation and its people.

ELECTRIFICATION ON THE FAMILY-SIZED FARM

Electrification is a great rural need, not only to make homes brighter and housework easier but to aid in dozens of production tasks, particularly on family-sized farms. Because it serves that dual purpose, electricity is more essential on the farm than in the city; yet, even after the great advance of the past 10 years, only 45 out of 100 farm homes have electricity in comparison with about 95 out of 100 homes in cities. The Rural Electrification Administration has plans for wide extension of its program on a complete area-coverage basis as soon as materials and manpower are again available.

The family-sized, owner-operated farm is the backbone of our agriculture and a foundation stone not only of our rural society but of our entire national life. But many who prefer the family-sized farm doubt that it will survive in the postwar world, when emphasis on new techniques and efficient high-volume production will be much increased. The great weakness of the family-sized farm, in contrast with large-scale units, is its lack of capital for such things as modern machinery. Rural electrification can help, at moderate cost, to overcome this handicap. It gives the smaller farmer many of the advantages of mechanization.

Inded, rural electrification contributes not only to the health, welfare, and income of farm families but also to the progress of rural communities, industries, schools, and churches. Electric service in the home means a better standard of living, better food preservation, adequate lighting, improved sanitation, and a lessening of drudgery. Electric power makes farm operations more effective and more profitable. It helps thousands of farmers in this country to increase their food production when, as at present, farm labor is scarce.

The Federal rural electrification program has been in operation for 10 years. Established by Executive order on May 11, 1935, it has financed lines which carry light and power to farms in the United States. These lines represent a tremendous net gain. Partially, they realize a vision of rural electrification extended far beyond the narrow concept of service that prevailed previously.

Necessarily, the rate of progress has declined during the war; yet a very substantial number of additional farms have been connected to power lines under authorizations of the War Production Board. The orders have recognized the value of farm electrification in alleviating labor shortages, and have allowed and facilitated extensions to thousands of farms that could put electricity to work in the war food effort. In addition, REA has emphasized electric systems to provide power for military installations and rural war industries.

Progress in farm electrification before the war was attributable about equally to the private utilities and REA projects. In the war years, approximately three-fourths of farm connections approved under WPB regulations were made by REA-financed systems. The monthly average of farm connections made by REA systems in 1945 was about equal to the REA monthly average over the entire preceding period of the agency's existence. Almost as many farms have been connected to REA-financed power lines during the past 2 years as during the first 4 years of the program.

This record should be appraised in the light of the many difficulties that have hampered line construction in the war years, such as the uncertainty of the materials supply, the scarcity of skilled labor, the necessity of making numerous comparatively short extensions, the unavoidable increase in paper work. Wartime farm electrification, conducted under U–1 orders of WPB, resulted in the connection of almost 200,000 farms to lines of REA-financed systems and in an increase in the percentage of electrified farms from 38 percent in December of 1941 to 45 percent in December of 1944.

This wartime program has raised many new problems. REA has had to keep its borrowers currently informed of changing regulations, process extra thousands of individual work orders, assist borrowers in locating materials and in locating and training new employees in place of those inducted into the armed forces or drained off by war industries. Operating with a sharply reduced staff, it has effected many economies; it has eliminated or simplified many forms and streamlined many procedures.

REA and most of its 900 borrowers in 45 States have also given time to postwar planning, and looked to peacetime possibilities for electric service. To determine the size and scope of the job ahead, many REA borrowers have furnished surveys of unserved farms and rural homes.

Report on Electrification Prospects

Based on these surveys, on the proposals of State agricultural planning organizations and State and National groups, and on its own experience, REA has issued a report entitled "Rural Electrification After the War." This report, approved by the Department's Interbureau Committee on Postwar Programs, includes an estimate of the additional rural electrification that can be accomplished under favorable conditions within 5 years after materials and labor again become generally available. It concludes that a vigorous 5-year national program by private utilities, cooperatives, and public agencies together can provide service to 3,655,000 additional rural families. The carrying-out of this program would provide, directly and indirectly, about 2¼ million man-years of employment.

The report includes also a proposal for a 3-year REA program which, with self-liquidating loans, would double the present number of rural consumers served by REA-financed systems. Table 1 is based on the material contained in the report.

TABLE 1.—*Proposed 3-year REA program for postwar rural electrification, by States* [1]

[Tentative]

State or Territory	Rural consumers to receive service	Total man-years of labor	Investment required for program	
			Distribution lines	Related facilities [2]
	Number	*Number*	*Dollars*	*Dollars*
Alabama	42, 700	5, 000	10, 000, 000	2, 000, 000
Arizona	5, 200	1, 000	2, 000, 000	100, 000
Arkansas	47, 400	7, 500	15, 000, 000	5, 100, 000
California	3, 700	800	1, 500, 000	750, 000
Colorado	15, 900	3, 000	6, 000, 000	3, 400, 000
Connecticut				
Delaware	3, 000	500	1, 000, 000	250, 000
Florida	10, 100	1, 500	3, 000, 000	1, 750, 000
Georgia	89, 500	10, 000	20, 000, 000	5, 600, 000
Idaho	5, 100	1, 000	2, 000, 000	1, 950, 000
Illinois	42, 700	7, 500	15, 000, 000	4, 500, 000
Indiana	34, 900	5, 000	10, 000, 000	4, 525, 000
Iowa	51, 600	10, 000	20, 000, 000	7, 000, 000
Kansas	23, 300	4, 500	9, 000, 000	3, 600, 000
Kentucky	46, 600	6, 000	12, 000, 000	3, 500, 000
Louisiana	37, 500	5, 000	10, 000, 000	6, 100, 000
Maine	1, 300	200	400, 000	125, 000
Maryland	6, 900	1, 200	2, 500, 000	800, 000
Massachusetts				
Michigan	12, 300	2, 000	4, 000, 000	3, 600, 000
Minnesota	57, 700	11, 000	22, 000, 000	9, 500, 000
Mississippi	53, 300	6, 000	12, 000, 000	3, 500, 000
Missouri	114, 600	15, 000	30, 000, 000	16, 500, 000

[1] The 3-year period after materials and manpower become available in quantities sufficient to permit general resumption of primary-line construction. Construction costs are based on REA prewar experience.

[2] Loan funds to finance improvement of existing electric systems, the construction of generation and transmission facilities, and the purchase by rural consumers of farm and home electric installations.

TABLE 1.—*Proposed 3-year REA program for postwar rural electrification, by States*—Continued

[Tentative]

State or Territory	Rural consumers to receive service	Total man-years of labor	Investment required for program	
			Distribution lines	Related facilities
	Number	*Number*	*Dollars*	*Dollars*
Montana	10, 300	2, 000	4, 000, 000	1, 100, 000
Nebraska	24, 700	5, 500	11, 000, 000	2, 300, 000
Nevada	500	100	200, 000	55, 000
New Hampshire	2, 800	500	1, 000, 000	950, 000
New Jersey	800	200	300, 000	150, 000
New Mexico	8, 200	1, 500	3, 000, 000	1, 150, 000
New York	6, 600	1, 000	2, 000, 000	850, 000
North Carolina	71, 200	9, 000	18, 000, 000	10, 000, 000
North Dakota	15, 600	3, 000	6, 000, 000	3, 000, 000
Ohio	16, 500	2, 500	5, 000, 000	2, 750, 000
Oklahoma	77, 700	12, 500	25, 000, 000	13, 800, 000
Oregon	13, 300	2, 500	5, 000, 000	2, 000, 000
Pennsylvania	17, 200	3, 000	6, 000, 000	5, 300, 000
Rhode Island				
South Carolina	34, 000	3, 800	7, 500, 000	3, 550, 000
South Dakota	14, 700	3, 000	6, 000, 000	1, 750, 000
Tennessee	57, 900	6, 000	12, 000, 000	4, 600, 000
Texas	157, 200	25, 000	50, 000, 000	16, 000, 000
Utah	2, 500	400	750, 000	800, 000
Vermont	4, 000	800	1, 500, 000	1, 850, 000
Virginia	26, 200	4, 200	8, 500, 000	6, 700, 000
Washington	12, 200	3, 000	6, 000, 000	1, 750, 000
West Virginia	3, 200	500	1, 000, 000	350, 000
Wisconsin	34, 400	6, 000	12, 000, 000	8, 700, 000
Wyoming	9, 800	2, 000	4, 000, 000	1, 300, 000
Alaska	900	200	400, 000	350, 000
Virgin Islands	1, 600	100	200, 000	200, 000
Total	1, 329, 300	202, 000	403, 750, 000	175, 455, 000

Wholehearted Federal support of such a program is desirable for three reasons:

1. Rural homes need electricity as much as, if not more than, city homes do. Farm families cannot have a decent standard of living without the things which electricity provides.

2. The furnishing of electricity to farmers offers an opportunity for such service to agriculture as the Federal Government can properly give.

3. REA cooperatives, because they are organized for service and not for profit, afford the best means of getting electric service to the largest number of rural people at the earliest date.

These three reasons undoubtedly influenced Congress when, in September 1944 it enacted legislation which reduced to 2 percent the interest rate on outstanding and future REA loans, permitted extension of the loan period to 35 years, and eliminated the statutory time and maximum yearly amount limitation from loan contracts. This legislation has greatly increased the capacity of REA borrowers to broaden their service.

Subject to the requirement of the Rural Electrification Act that all loans be self-liquidating, REA has always operated on the principle that electricity should be made available to all farms and other rural establishments within an area; to small users as well as large; to farms on back roads and in isolated locations as well as to those in thickly settled regions along main roads. Many REA-financed lines cross fields and sparsely populated neighborhoods to reach remote farms.

Postwar REA expansion plans emphasize this principle of area coverage. It is the intent of Congress, as expressed in the Rural Electrification Act, that electric energy be extended to persons in rural areas who are without central station service. REA cooperatives feel that they have an obligation to bring electric service to every unserved rural establishment that can be reached without jeopardizing repayment of Government loans on schedule.

The only limiting factor as far as REA borrowers are concerned is the necessity of obtaining enough revenue for operation and maintenance and for scheduled liquidation of the Government loan. This limitation has grown progressively less burdensome as the members of REA cooperatives have learned to make fuller and more effective use of electric power in their homes and more particularly on their farmsteads. Increased consumption of electricity means more revenue to the cooperative and enables it to extend into still thinner territory. Other legislation, for example, the Pace Act, also supports area service.

Area Coverage Desirable

There is no fixed, absolute formula as to the average number of consumers required per mile of high-line to assure feasibility of a Government loan to an REA cooperative. It is obvious, however, that a low average consumer density over the entire system offers less possibility of achieving complete area coverage than a relatively high density. This explains why REA cooperatives have objected, and still object, to attempts of commercial power companies to build lines only to selected sections of relatively high consumer density in an area and to disregard the need for electric service in the more sparsely populated sections of the area.

Such a selection by commercial power companies may prevent many farms from receiving electric service, since there is a limit to how far even a nonprofit enterprise, such as an REA cooperative, can safely go in spreading itself thinner and thinner. The prospects of full area-wide service on a self-liquidating basis are greatly enhanced by combining both the more densely and the more sparsely populated sections in a rural area in the line network of one system.

Therefore, a comprehensive job of bringing electricity to the rural people still unserved can be done best if the principle of area service is followed by all rural power systems. To the extent that commercial power companies may not find it feasible to operate on that basis, they will serve the public interest and the rural people by leaving such rural area development to nonprofit cooperatives or to public power districts.

Need of Careful Planning

As the past 10 years have demonstrated, one good way to get electricity to the greatest number of farmers, without resorting to subsidies, is through nonprofit organizations financed with REA loans. The job requires careful planning, both by REA and by local borrower organizations. Progress will largely depend on foresight. Legislation to facilitate longer range planning and line construction has been introduced in Congress. If passed, it should assure dependable, economical electric service to thousands of farm families who now face the prospect of being bypassed. Thousands of other homes in rural America would be helped by this legislation to obtain area-wide electrification.

PROGRESS WITH CROP PLANTS

The war stimulated the creation of many new improvements in crops and in methods of crop production, and also put on pressure that speeded the development of trends and practices that had been under way. Plant science is often slow in advancing, particularly in the application stages, but in recent years it has made fast time. Expertly directed exploration of its resources has uncovered much fertile soil.

The backlog of agricultural productivity that helped to win the war was partly the result of plant science devoted to the development of important crops. Many of these gave higher yields, greater resistance to disease, and other advantages. Hence, they economized labor and released acres for other crops.

Records of the Bureau of Plant Industry, Soils, and Agricultural Engineering show that in the past 4 years more than a hundred new varieties have been released to the public, largely as the result of cooperative work with State experiment stations. These varieties were mostly the culmination of previous work, but new methods made it possible to multiply seed supplies of many of them quickly. The new varieties included grains, forage crops, fruits, and vegetables. A few were strictly the result of war-stimulated research; others became available more quickly than they would have done in peacetime.

The productive stiff-strawed Clinton variety of oats, now getting into big commercial production, is a good example. The first lot of Clinton seed, 25 pounds, was produced at Ames, Iowa, in July 1943 and planted on irrigated land at Mesa, Ariz., in November; from this planting about 2,000 pounds were harvested in April 1944. This was sown May 20 on irrigated land at Aberdeen, Idaho; it produced 20 tons, harvested in August, only a little more than a year from the original harvest of 25 pounds. The 20 tons (or about 1,200 bushels) were planted by farmer seed growers in the Middle West last spring. Now, only two years from the start, there are 40,000 bushels of Clinton oats (1,280,000 pounds) available for 1946 planting. Similar methods have put other results of plant breeding in the hands of farmers.

Adoption of new varieties of oats in the North Central States has made the oats crop much more dependable. In this region, when rust is not bad, the new varities increase yields by an estimated 10 to 15 percent; in bad rust years they increase the yields by as much as 100 percent over what would be harvested from the old varieties. In the big oats States the new high-yielding disease-resistant varieties are grown almost exclusively. Still better varieties such as the previously mentioned Clinton will be coming forward.

In the war years corn carried more weight than any other crop. It met the call upon it largely because corn breeders had provided improved strains. The preliminary development had been completed when the war began. During the war the acreage in hybrid corn in the Middle West practically supplanted other kinds. Since 1941 the use of hybrid varieties has been responsible for the production of probably two billion bushels of corn beyond what would have been produced with the old open-pollinated varieties. In 1920, our biggest corn year except 1942 and 1943, the United States grew 3,081,000,000 bushels of corn on 101,360,000 acres. In 1943 we grew a slightly larger crop on 6,570,000 fewer acres. The release of cornland permitted increased soybean growing, required to help meet the need for increased quantities of vegetable oils, proteins, and vitamins. Introduced long ago from the Far East, the soybean had been built up to the staple-crop stage. During most of the war period it supplied four-fifths as much vegetable oil as we had been importing before Pearl Harbor.

Well-adapted varieties made this performance possible. At the end of the last century we had only eight varieties of soybeans in this country. Now we have more than a hundred varieties—improved, adapted to specific regions, and suitable for particular purposes. They are the result of diverse but coordinated undertakings by scientists of this Department and many State experiment stations.

The Government asked for and obtained a great increase in peanut production. Agricultural engineers, soil scientists, and crop specialists had made it feasible for farmers to respond to this call. The scientists had developed superior strains and indicated better planting practices—such as double the old rate of seeding. Some of the better varieties, planted on good land, produced acre yields of oil of 50 to 100 pounds. Soil scientists did an emergency job in selecting suitable land. They helped to get out publications such as Peanut Production Possibilities, and provided maps that enabled farmers in the peanut growing areas to tell exactly where the excellent, good, fair, and unsuitable peanut lands are. Agricultural engineers developed a harvester that would dig, shake, and windrow peanuts—two rows at a time at a speed of 4 miles an hour. This reduced the labor requirement to half a man-hour per acre. With the one-mule equipment and the hand methods used before, 20 to 25 man-hours had been required.

Improved Utilization of Fertilizer

The fertilizer problem was serious owing to shortage of labor, demand for the same materials for other war purposes, and the removal

of plantfood from the soil by bigger yields of crops. Nitrogen was in great demand for farm use and also for making explosives. Fertilizer specialists, in cooperation with the fertilizer industry, devised means for the farm to use surplus military ammonium nitrate produced through the fixation of atmospheric nitrogen. Emergency studies showed how to prevent the caking of ammonium nitrate, a difficulty which previously had made its distribution to crops in the field almost impossible.

New knowledge of proper fertilizer placement for different crops and different soils added to the efficiency of fertilizer. Agricultural engineers and agronomists of the Bureau, in cooperation with State experiment stations and the fertilizer industry, worked out and distributed detailed information. Manufacturers produced adjustable distributors. As a result, the yields of many crops were increased with no increase in labor and sometimes with a saving of fertilizer. In particular instances the increases in yields per acre from this factor amounted to 30 bushels of potatoes, 230 pounds of seed-cotton, 1 to 2 tons of tomatoes, 650 pounds of snap beans, 3,000 to 5,000 pounds of garden beets, and 200 to 250 pounds of peas.

Early in the war the country was threatened with a shortage of vegetable seed. By surveying various areas and finding where certain seeds could be grown and where certain areas already used for such production could be expanded, plant specialists helped seed growers to solve this problem, aggravated though it was by the demand from Victory Gardens. Enough of many common kinds of seed became available for shipment from this country to other United Nations.

Production of Sugar Beet Seed

Our sugar production benefited by freedom from the former necessity of buying beet seed from Europe. Between the World Wars, plant breeders had developed disease-resistant varieties that met the threat of curly top disease. They had also developed methods for producing sugar beet seed here. When World War II blocked world trade, we were able to supply seed for our own sugar beet crop and for the fields of our beet-growing allies.

Our supplies of sugar-beet seed are now abundant, as a result largely of the cooperative development, by this Department and the New Mexico Experiment Station, of the "field overwintering" method. This procedure eliminates digging at the end of the first season, storing during the winter, and replanting the following spring. It saves much labor and expense.

Agricultural engineers, through Federal-State efforts, developed new machinery for planting and cross blocking sugar beets so as to obtain suitably spaced plants without expensive and tiring thinning by means of stoop labor. They devised the method of shearing sugar-beet seed, so that, instead of planting balls containing several germs and growing clumps, it is now possible to plant many more single germs. This method, along with the use of modern thinning equipment, proved extremely useful during the war years. Since 1943 hundreds of thousands of acres of beet lands, principally in the ir-

rigated regions of the West, have been planted with sheared seed. The procedure cut down the labor, which is very arduous, by 25 percent.

Rubber Investigations

Plant scientists studied more than 50 plant species as possible sources of rubber production in this country—principally such plants as cryptostegia, kok-saghyz, goldenrod, and guayule. Specialists from this country worked to promote economical rubber production in South and Central America through permanent, small-farm plantings of the hevea tree. Working cooperatively with 14 countries, the experimenters made progress in developing high-yielding disease-resistant strains.

Cinchona seedlings for the production of quinine were grown in this country from seed flown out of the Philippines at practically the last opportunity before the arrival of the enemy. The seedlings, handled by a special technique developed in the Department, did very well on transplanting after air shipment to several places in tropical America.

Another crop from the Philippines, abacá or Manila hemp, provides the strong hard fiber that makes the only really satisfactory marine rope and is deemed best for other high-grade cordage. It was introduced twenty years ago to tropical America by a specialist of the Department. By 1940 about 2,000 acres of plantings had been established in Central America. This acreage was soon expanded to 30,000, mostly in Panama, Costa Rica, Guatemala, and Honduras. By 1945, when our stock of abacá from the Pacific has been used up, Central American production had increased to approximately 20,000 tons a year, nearly half as much as the annual prewar importation.

Growth-Regulating Substances

Scientists have recently found that certain so-called growth-regulating substances, called hormones, are useful as herbicides that will kill some plants and not others. Studies by Department scientists and many in other research organizations have shown great promise as a weed killer for one of these substances—2,4-dichlorophenoxyacetic acid. A method devised by the Bureau of Plant Industry, Soils, and Agricultural Engineering, and tested in collaboration with State agricultural experiment stations and the United States Golf Association, has shown good results on lawns, golf courses, grainfields, and areas bearing other plants of the grass family. It is not yet recommended for pastures. It does not hurt Kentucky bluegrass or weed grasses such as crabgrass and quackgrass, but it affects bent grasses and White Dutch clover and a considerable list of weeds.

Only a short while ago these growth-regulating substances were known only for their capacity to stimulate the rooting of plant cuttings difficult to propagate. One of them, alpha-naphthaleneacetic acid, joined the lengthening list of farm chemicals a few years ago when horticulturists found it useful to prevent preharvest drop of apples and pears. Now, along with the use of such substances as weed killers, plant scientists use them to promote quicker ripening of certain fruits.

Hydroponics or "Tank" Agriculture

Plant nutrition specialists of the Department who have contributed to the development of techniques in hydroponics, or "tank agriculture," were called upon during the war to assist the Army Air Force in supplying fresh vegetables in distant places where production of such crops is difficult. A few men in the service undertook hydroponic vegetable production as a hobby with some success. An official decision followed to use the method for growing raw salad crops in places where soil or rainfall was lacking, such as on Ascension Island in the South Atlantic, an airway station, and on islands in the Pacific where soil contamination makes it unsafe to eat uncooked vegetables. The method uses a gravel bed; the gravel provides mechanical support for the plants. Gradually improved over a number of years by commercial growers with assistance from Federal and State investigators, hydroponics provided one of the most interesting ways used to keep up the health and morale of our military forces.

CHEMISTRY AND CROP UTILIZATION

As a result of research by the Department's chemists and by other scientists, the products of corn and wheat are now being used in the manufacture of many of the synthetic tires that are rolling from the assembly lines. Penicillin, the remarkable new life-saving drug, is rapidly becoming available to physicians, because agricultural scientists quickly developed methods for producing it on a commercial scale.

The Bureau of Agricultural and Industrial Chemistry has had more than 1,000 persons at work in its various laboratories on projects dealing with the use of agricultural commodities in the war effort. The program includes work on penicillin, soft-grit blasting materials, apple sirups, saccharification of agricultural residues, rotproofing of sandbag material, new cotton fire hose, stabilization of guncotton, rutin, vegetable-waste substitutes for natural rubber, cotton tire cord, peanut glue, dehydration of fruits and vegetables, sweetpotato starch, and substitutes for palm oil and other imports that were cut off by the war.

Its scientists played a particularly important part in the development of the new drug penicillin, which was in the laboratory stage when the problem of increasing production was presented to workers in the Bureau's Northern Regional Research Laboratory at Peoria, Ill., in the summer of 1941. This laboratory was selected because some of its scientists had years of experience in the use of molds in the fermentation field, and because it had one of the largest collections of molds in the world. By selecting better strains of molds, and feeding them on a new diet composed of corn steeping liquor and milk sugar, the workers were able to increase quickly the yield of penicillin more than 100 times. Commercial production rose from nothing in 1941 to 21 billion Oxford units in 1943, and to 3,035 billion units during the first 6 months of 1945. The price of penicillin in 1943 was $20 per 100,000 units, the amount required to treat serious types of infection.

The latest quotations run around 59 cents. This research made an important life-saving drug available to the armed forces and civilians much sooner than would have otherwise been possible, and it doubled the industrial outlet for a byproduct of the farm.

Crop Wastes for Decarbonizing Engines

One of the latest industrial developments to come out of wartime research is the use of ground-crop wastes in the new air-blasting method of cleaning carbon deposits from cylinders and pistons of aircraft engines. "Soft grit," made from finely ground corncobs or similar farm waste, is the material used. This method for using waste material for removing carbon was worked out by scientists in the Peoria laboratory in close cooperation with the Assembly and Repair Department of the Naval Air Station at Norfolk, Va. It has resulted in considerable saving of man-hours, making it possible to clean from 4 to 10 times as many parts in a day as by the old method of scraping by hand and sandblasting, which often damaged the parts. Excellent results are being obtained by using a mixture of 60 percent of corncob grits and 40 percent of rice hulls. These materials have been adopted by the Navy, which is taking the entire output of one factory making the grit according to desired specifications.

A noteworthy wartime accomplishment from the Eastern Regional Research Laboratory at Philadelphia, Pa., was the development of apple sirup, an excellent food product from sound but offgrade apples. It can also be made from apple peels and cores from canning and dehydration plants. It is a delicious table sirup, and is especially fine for baking cakes since its moisture-holding qualities prevent cakes from drying out rapidly. Apple sirup was used in the manufacture of cigarettes to replace glycerine, which was needed in making explosives. Five plants in the United States and Canada are making apple sirup on a commercial scale.

In the concentration of apple juice the Philadelphia laboratory has also worked out a process for recovering unaltered the full aroma of the juice in the form of an essence which holds up well in storage. Blending this essence with good apple juice concentrate gives a full-flavor concentrate from which by the mere addition of water there can be produced a beverage indistinguishable in taste and bouquet from fresh apple juice. The essence is also being evaluated by several industrial concerns for use in jellies, sherbets, ices, and confectionery and baking products.

Motor Fuel from Crop Residues

A process for the chemical conversion of such agricultural residues as corncobs, sugarcane bagasse, peanut shells, flax shives, oat hulls and cottonseed hulls and burs into liquid motor fuel is moving into large pilot-plant production at the Peoria laboratory. Results of experimental tests indicate that from 90 to 95 gallons of liquid motor fuel can be obtained from a ton of corncobs or cottonseed hulls, and that half of this is in the form of ethyl alcohol. A continuous process for the treatment of corncobs and cottonseed hulls has been worked out, and a suita-

ble building is now being constructed and equipped on the laboratory grounds. Corncobs will be the first of these so-called waste materials to be tried on a large scale in the new semiworks plant which should be in operation in the early part of 1946. Research on the other residues will be started later as the work progresses. About 200 million tons of farm wastes are produced each year. Much of this is plowed back into the soil to help maintain fertility and prevent erosion, but after this is done something like 100 million tons is left that might be available for use in making motor fuel under this new process.

A modified cotton fabric that will not mildew or rot has been developed by the Southern Regional Research Laboratory in New Orleans. The new material, a partially acetylated cotton somewhat related to rayon made by the cellulose acetate process, has the appearance and strength of ordinary cotton plus the ability to withstand the attacks of rot-producing microorganisms.

As a test of the rot resistance of this new material some of the treated cloth and thread were buried in the ground and in especially prepared soil beds teeming with the kinds of micro-organisms that would cause ordinary cotton to rot within a week. The investigations showed that the treated cotton could remain buried under such conditions from 6 months to a year with very little loss of strength. Sandbags made from the treated cloth, sewed with treated thread, and piled outdoors on the ground, were still intact after 2 years of exposure to the weather in the New Orleans climate. Unlike the preservatives now generally available for cotton fabrics, the new method or rot-proofing causes neither discoloration, odor, nor stickiness; nor does it make the fabric toxic, a great advantage when the treated cloth is used for food sacks.

This new development gives promise of being useful in two separate fields, each of which consumes considerable quantities of cotton. The treated cotton cloth, yarn, and sewing thread promise to be suitable for making clothing that will not mildew, tents and awnings that will not rot in damp climates, and fish nets that will not rot if put away wet. They are promising also for making rot-resistant bags for the packaging of fruits, vegetables, and other food products.

Shrinking of Cotton Yarns

At the New Orleans laboratory an improved all-cotton semielastic surgical bandage has been made from ordinary surgical gauze by means of a chemical shrinking process.

The effectiveness of the process comes from the increased crimp and kinkiness imparted to the yarns which result in making the fabric more elastic. Surgeons who have used this new semielastic bandage claim that it fits more snugly than ordinary bandage, particularly around joints and irregular surfaces. The increased elasticity makes the bandage flexible and somewhat self-tightening without restricting the circulation of blood. The uneven surface and the kinky fibers and yarns in the fabric cause layers of bandage to interlock, eliminating slippage.

Another treatment of cotton to adapt it to new uses was developed in connection with an anticipated necessity for fire hose without a rubber lining to replace linen hose. It was found that by adding a swellable finishing material, not soluble in water, to cotton yarn before weaving improved the swelling capacity of the cotton fabric. Any form of cellulose or its derivatives that can be made into a suitable solution, and meets other requirements, can be used. By this process an unlined cotton fire hose was successfully made. It is hoped, too, that in the future the process will prove applicable to such fabrics as tent cloth, tarpaulins, and outer rain-resistant clothing.

Considerable time can now be saved in making cellulose nitrate for smokeless powder as a result of wartime research in the Southern laboratory. The speed-up is effected by the use of ammonia to remove the last traces of sulfuric acid from the nitrated cotton, thus saving more than half of the 48 hours of washing in boiling water required for making smokeless powder by the usual method.

Boiling is one of the big jobs in making guncotton suitable for the manufacture of smokeless powder, because all impurities have to be removed from the guncotton so that it can be stabilized to the point where the powder will retain an unchanged punch for years. In laboratory tests, 8 to 12 hours' boiling has been sufficient under the new process. The cold chemical bath makes up for the rest. The bath consists of immersing the cotton in cold water containing a small amount of ammonium hydroxide. This treatment requires 1 minute in laboratory experiments. On the basis of these experiments, the scientists estimate that it would take about half an hour to apply the ammonia treatment to a 7,000-pound batch of cotton, the amount that is usually boiled at one time in making smokeless powder. The chemical bath would reduce the number of boiling tubs needed in a guncotton nitration plant by about half, and afford savings in fuel, transportation, and other items necessary in the production of smokeless powder under existing conditions.

Extensive clinical testing has confirmed the proposal made by scientists at the Eastern Regional Research Laboratory that rutin is valuable in the treatment of increased capillary fragility associated with high blood pressure and disease conditions derived therefrom such as retinal hemorrhage, apoplexy, purpura, and pulmonary bleeding. Rutin was first isolated by these scientists from flue-cured tobacco, but it has now been found that buckwheat is a more economical source of the glucoside. The process for its preparation has passed through the laboratory and pilot-plant stages and is now being used for the commercial production of rutin.

Livestock Feed from Vegetable Leaves

In an effort to find a profitable use for some of the large tonnage of waste leaves that occurs in the production and processing of vegetable crops, researchers in the Philadelphia laboratory developed a process for making a vegetable leaf meal which produces excellent results in poultry feeds.

The blade portions of the leaves were found to be high in protein, containing from 30 to 36 percent in some cases. which is higher than

alfalfa leaf meal. The research has revealed that the leaves are also high in carotene, or pro-vitamin A, and in riboflavin, both of which are needed in poultry feeds. Practical feeding tests have been made by the Delaware Agricultural Experiment Station, where the meals were incorporated with the mash. Chicks fed on the mash containing broccoli leaf meal made the fastest growth. Carrot, lima bean, and turnip meals were about equal to alfalfa, and pea vine meal a little lower. The flavor of the meat of all broilers fed on the vegetable leaf meals was good, but that of the birds fed on broccoli leaf meal was the best and unusually fine.

It is estimated that more than 2½ million tons of waste occur annually in the production and processing of nine of our most common vegetables. Profitable outlets for at least a part of this material should help the producers of these crops. The work is being continued in the hope of expanding the outlets for more of these so-called waste materials.

Normally about 98 percent of the starch produced in the United States comes from corn, of which there is usually a plentiful supply. But when war needs called for large quantities of corn to feed badly needed meat animals, efforts were made to find ways to produce starch from other agricultural raw materials. Scientists in the Peoria laboratory quickly worked out two methods for the production of starch from wheat. In one of these whole wheat is the raw material used. It is processed in the same equipment as that used in the wet milling of corn. The other method is known as the "batter" process. In this process wheat flour is the raw material and the method is adaptable to equipment used in beet sugar plants. Very little new equipment is required in either case. The starch produced by either method is suitable for conversion to glucose sirups, and in both cases gluten can be recovered for use as a high-protein feed. The gluten recovered in the flour process is sufficiently pure for use in the production of glutamic acid which is needed for our food program. Wheat sirup is now being produced on a commercial scale by both processes.

Chemistry Aids Rubber Investigations

When war threatened to cut off imports of natural rubber, scientists increased their efforts to find new ways to produce rubber and rubber substitutes. They worked out an economical method for the commercial production of butylene glycol by the fermentation of corn and wheat. Butylene glycol can be used for making antifreeze for automobile radiators, in the production of commercial solvents, or converted into butadiene and used in making synthetic rubber. When used in the production of synthetic rubber, a bushel of corn will produce 14 pounds of butylene glycol, and this, in turn, can be converted into 7 pounds of high-quality butadiene that can be used in making synthetic rubber. The process was proven on a large semiworks scale and complete operating details worked out so that it could be used if needed.

Norepol, a rubber substitute was developed from soybean oil, and considerable quantities were produced in commercial plants before the need for the oil for food purposes took priority over the rubber work.

Scientists were successful in developing a simple process for extracting natural rubber from kok-saghyz (Russian dandelion). Sufficient rubber was extracted in the Philadelphia laboratory to enable one of the large tire manufacturers to make up 17 heavy-duty truck tires and another manufacturer to make 50 standard passenger automobile tires. Both styles of these tires were tested and found to be satisfactory.

The New Orleans laboratory extracted natural rubber from the leaves of the goldenrod plant. The tensile strength of this rubber was equal to that of natural tree rubber from the Orient. Enough was produced, about 550 pounds, to enable a manufacturer of bicycle tires to make up a quantity of tires which road tests proved to be equal to prewar natural rubber tires.

Another wartime contribution that scientists made to the rubber problem was the development in the New Orleans laboratory in an improved cotton tire cord. An elaborate and exhaustive program involving cotton varieties was carried out. Road tests on tires made from selected varieties of cotton showed that cotton cords can be made that are definitely better than the cotton tire cords that are in use today.

A cold glue made from peanuts is likewise the result of research by agricultural chemists. The new peanut glue has the sticky qualities of flypaper, when wet but is dry to the touch before moistening. The light color which does not materially affect the color of the surface to which it is applied makes this glue especially desirable for certain work such as binding books, making gift boxes, etc. It can also be used in bonding plywood, and for that purpose is about as satisfactory as casein glue which is made from skim milk, but it can be made considerably cheaper than casein glue.

Precautionary Types of Research

Many types of research were carried on during the war purely as precautionary measures. One of these was the development of a cotton cutter that would cut ordinary lint cotton into short lengths similar to cotton linters. Linters are used in making smokeless powder. There was some fear at the beginning of the war that we might not have enough linters to take care of our needs and those of our allies, so steps were taken to safeguard us against possible shortage of this product. At that time we had plenty of surplus lint cotton stored in Government warehouses, but it wasn't suitable for use in making guncotton. The fibers were too long—so long in fact that they would bunch and ball and literally "tie up" the washing and purification process necessary in making guncotton. Scientists remedied this situation by designing and building a machine that cut the cotton into short pieces about one-tenth of an inch long. These were found to pass through the washing process without any difficulty. On the basis of these laboratory and pilot-plant tests a full-scale commercial cutter is now being built by a large cotton oil mill company. This project was sponsored by the War Production Board, so that we might have a suitable cutter in case it was needed.

An increasing amount of the 1 ton of food that is needed by each individual per year is being preserved by the various methods of

freezing. There has been a tremendous increase in the frozen packs of vegetables, apples, apricots, peaches, and cherries in the last few years, as well as the addition of a number of new products to the frozen food field. Frozen precooked foods, frozen purees, "Velva Fruit," and the freezing of fresh fruit as it comes from the field in lug or harvesting boxes are some of the more recent developments in frozen foods. There have also been developments in the packaging of frozen foods. Research in the Department's Western Regional Research Laboratory at Albany, Calif., has aided materially in these developments, which have benefited both the commercial grower and the industrial consumer of fruits.

Research on the dehydration of vegetables, in the Bureau's Western Regional Research Laboratory at Albany, Calif., was valuable in the war effort from the very start. Through pilot-plant experimentations the scientists were able to get the answers quickly to a number of important problems. Partly on the result of this work the dehydration industry was able to go ahead on the large-scale production of dehydrated vegetables for the armed forces. More than a half billion pounds of dehydrated foods was produced annually during the war years, and much of it was done according to methods worked out in the California laboratory. One of the latest developments of that field is the addition of a desiccant to packages of dehydrated vegetables. This desiccant absorbs the moisture in the can and makes the vegetables keep longer.

Research on the production of a satisfactory white starch from sweetpotatoes has continued throughout the war years. A method for the blending of different batches of starch into a uniform product has been worked out at the Laurel, Miss., starch plant. The large commercial sweetpotato starch plant located in Florida, which is based on the results of research at the Laurel plant, is nearing completion. It will have an annual capacity of around 50,000,000 pounds of starch which is a considerable portion of the amount of root starch we import each year.

Tannin from Domestic Sources

The rationing of shoes brought home to us the need not only for the conservation of leather, but for the development of domestic supplies of tanning materials needed to help meet the demand for leather goods for war purposes. Normally this country imports about two-thirds of its vegetable tanning materials. War curtailed these imports. Scientists are now investigating the feasibility of using the tannins from domestic grown sumac, canaigre root, Western hemlock bark, scrub oak, and other native plants. Tannin extracts from the canaigre root, which grows wild in the Southwest but which may be cultivated in other parts of the South, produced satisfactory leather in experimental tests, after some of the troublesome constituents were removed. Southern scrub oaks produced a tannin material that was also found to be satisfactory. The most promising of these investigations are being continued in the hope of finding a safe and ample substitute for tanning imports in case they are ever again cut off and also to augment the diminishing supply of domestic materials.

Plastics, Proteins, and Synthetic Fibers

Research on plastics, industrial proteins, synthetic fibers, substitutes for palm and other industrial oils, and for other things needed in the war effort has been emphasized by scientists in the Bureau of Agricultural and Industrial Chemistry. The work continues with a shifting of emphasis to peacetime needs, in the hope of improving the income of the producer and increasing the number of industries that draw their raw materials from the farm.

PERSONNEL ADMINISTRATION

Wartime problems of personnel administration in the Department reached their peak this year. Turn-over continued high; at 49.4 percent it was in marked contrast to the 10.0 to 15.0 average of peacetime years. Emphasis on employment of women, who this year comprised 37.5 percent of our staff, and of young persons and retired employees, continued. At the end of the year only 250 of the more than 60,000 full-time employees were in occupationally deferred status.

This year saw the beginning of the "personnel conversion" situation. About 1,000 of the 17,972 employees on military furlough returned to the Department. As of June 1945 about 8,000 employees had transferred from the Department with civilian reemployment rights. In contrast to this group and that on military furlough, it is estimated that on June 30, 1945, 35 percent of the Department's employees had a war-service status; that is, they had been appointed for the duration of the war and 6 months thereafter and were subject to transfer or to separation from the Department on the return of employees from military furlough or of employees with reemployment rights.

Plans had been laid to handle the situation. Procedures proposed at a 1943 conference of Department personnel officers and administrators had been incorporated in legislation or in regulations issued either by the Civil Service Commission or by the Department. A handbook entitled "What to do When the Veterans Return to Their Jobs in the Department of Agriculture," furnished guidance for administrators.

The Office of Personnel, jointly with the Office of Budget and Finance, led a management-improvement and manpower-utilization program, which during the year encouraged each bureau to make a self-examination of management efficiency at every level of organization and develop improvements. Up to June 23, 1945, estimated savings of more than $3,000,000 were reported as a result. Many reports described results which could not be reduced to dollar values.

An agreement worked out with the Veterans' Administration permits departmental agencies to train veterans under provisions of Public Laws 16 and 346, Seventy-Eighth Congress. Employees returned from military furlough can take advantage of these laws while being trained or retrained. Personnel will be in short supply for many of the Department's professional fields, because many young people who would have entered the Department from the colleges, particularly the land-grant colleges, have been in the armed forces.

To help meet this need the Department has cooperated with land-grant Colleges and universities in pointing out qualification requirements. In addition, on-the-job training will be stressed; the Department's Graduate School has begun to expand training opportunities.

General personnel policy delegates authority widely for operative phases of personnel work to departmental and field representatives. As a result of this policy, decisions are made as close as possible to first-line supervisors and the employees affected. Thus the role of the Office of Personnel, in its over-all responsibility, becomes increasingly that of a policy-making and service agency. In the fiscal year 1945 only 1.7 percent of the 150,000 personnel actions required central approval.

THE SUMMING UP

It has been my object, in choosing facts for this report, to provide some basis for an appraisal of what has happened in the war years and also some indication of what may lie ahead. The outstanding feature of these times is change—technological, economic, and political, with the word political understood not in the partisan sense, but in the sense of national and world policy. Agriculture along with industry has emerged from the war with huge new potentials for an economy of abundance. If it is to use its potentials efficiently, it must know what they are, how they have developed, and what scope they need. I hope the data given with regard to farm technology, farm science, and farm production and distribution will show the kind of knowledge we require, and will stimulate the quest for more of it. Needless to say, the information in this report is scanty compared with the quantity available in Federal and State agricultural institutions; but I hope that it is of the right kind, and will help to sketch the lines on which we should be working. There is one clear lesson. We must abandon the old defensive economy and make an aggressive coordinated attack on scarcity, so that the production-capacities of agriculture and of industry can be continuously and fully employed.

Secretary of Agriculture.

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